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CHARLES W. PRICE . . . . . PRESIDENT AND EDITOR
STEPHEN H. GODDARD . . . . . SECRETARY AND MANAGER
WM. HAND BROWNE, JR. . . . . TECHNICAL EDITOR
AINSLIE A. GRAY . . . . . MANAGING EDITOR

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MAGNETIC LEAKAGE MEASUREMENTS.

The determination of the leakage coefficient of dynamo-electric machines is of considerable importance. Formerly it used to be done by a more or less elaborate but accurate method, at considerable expense of time and patience. Later more convenient, though less accurate, methods were evolved for this purpose, which gave the coefficient with sufficient exactness for engineering purposes; but even these usually required a good deal of fussing about the machine, and left much to be desired.

About five years ago a much improved method was described by R. Goldschmidt, in which the electromotive force set up by the collapse of the field flux was balanced by the similar collapse of the armature flux, and a zero method thus obtained. This method, we believe, was used and described even a little before by J. D. Nies. It is very pretty and quick, as it is only necessary to wind a few turns of wire on the armature, and a smaller number upon the field coil, and vary the latter until a minimum deflection is obtained. Unfortunately, it lacked in accuracy, because, using, say, ten turns on the armature enabled each coefficient to be determined within ten per cent only.

In a recent issue of the London *Electrician,* Dr. R. Pohl describes two improvements on this system which give it the much-desired accuracy. An abstract is given of this on another page. It is done by varying the resistance in the two circuits of the armature and field test coils until a balance is obtained. This may be accomplished either by connecting the two circuits directly in series or by connecting them across a potentiometer, the deflection being observed by means of a sensitive galvanometer. In this way any desired accuracy may be obtained. Moreover, the method calls for no apparatus that is not found in every laboratory. It is very simple to apply, and the results are given quickly and directly.

The only objection one can make to these systems is the necessity for a delicate ballistic galvanometer. At times it is inconvenient to use galvanometers in the dynamo laboratory. This, as is pointed out, may be overcome by winding more turns of wire in the two coils, and using a less sensitive instrument, such as a milli-voltmeter. But it seems likely that a telephone receiver could be used here to good advantage. It would be easy to determine when the click in the instrument is a minimum, or perhaps inaudible, whenever the field circuit was opened; and with this arrangement, the test could be applied quickly and readily under almost any conditions.

It will be remembered, of course, that in these tests it is seldom advisable to determine the leakage coefficient with the full exciting current passing through the field winding. This

is usually done with the lower excitation, and by means of the machine's characteristics the true value for the coefficient at full excitation may be easily computed. Of course, all systems utilizing the collapse of the field for measurements are subject to this same drawback.

THE ELECTRICAL FIRE HAZARD.

There has been some discussion during the last few years regarding the fire hazard of electricity. There has always been a feeling on the part of the central station people that the fire insurance companies were more or less prejudiced against electricity, and this reacted in a way to retard the growth of the electric lighting industry. Within the last year or two the National Board of Fire Underwriters, through its electrical committee, has collected statistics of fires attributed to electrical causes, and had these printed; and the central station man felt that this was, in a sense, going out of the way to call attention to electrical fires—that if such statistics were published, they should contain data relating to all illuminants, and not deal simply with one of them. These arguments were presented at one of the meetings of the electrical committee, but it took the stand that the report was not intended to disparage electricity as an illuminant, but merely to point out that there are, at times, risks, and that more attention should be paid to the proper installation of electric wiring than is being done. It was said that, when properly installed, the electrical system is the safest of all, but it is so easy to put in a system which will work that this is frequently done by incompetent men, and that in this way the risk introduced is, at times, great.

The central station men were not altogether satisfied with the situation, and a committee of the National Electric Light Association was appointed to go into the matter and report upon the fire hazard of electricity; to determine, if possible, what it was as compared with other illuminants, and to offer any suggestions for improving it and to securing for the electric light greater confidence on the part of the public. This committee presented a full report at the convention last week, giving such statistics as were obtainable, and opinions secured from many central stations and from insurance companies.

Statistics were obtainable from a few cities only, and these are not altogether satisfactory. For example, a report covering Manhattan and The Bronx shows an exceptionally large loss, due mainly to a single fire starting in a street-car on the street. The car, unfortunately, was pushed into the shed, and set fire to the latter, resulting in a loss of $200,000. For this reason the report for that year shows somewhat unfavorably as compared with the reports for other years and other cities. However, out of 5,500 fires from 1902 to 1906 in Manhattan and The Bronx due to illuminants, but 457 fires were caused by electricity. Of the total fires, 1.3 per cent were due to electricity, and fourteen per cent to other illuminants. Of the total number of fires during the four years referred to, nearly 4,000 were due to careless use of matches; over 2,000 to defects in chimneys, flues, etc.; stoves and furnaces caused nearly 2,000; candles, 1,600; gas lamps, 1,000; escaping gas, 857; gas stoves, 624; kerosene, benzine, gasolene, etc., 479; electric wiring, 457. These figures, of course, show only what actually occurred, and do not take into consideration the relative use of the apparatus which gives rise to the risk. Statistics from the Boston Protective Department for the year 1906 show that out of over 3,000 fires, electricity gave rise to only sixty; matches to 340. A report from Chicago shows that out of 3,597 total fires, electric wires gave rise to only sixty-three; matches to 636. These figures certainly augur well for the safety of the electrical system. A striking and interesting feature of these reports, although not exactly connected with the electrical fire risk, is the large number of fires due to the careless use of matches. These, in general, average from thirty to fifty per cent greater in number than any other single cause. Although fires started in this way are, on the average, small—probably because they are quickly discovered—it is startling to learn how frequently they do occur. This argues for some restriction in the use of matches, and it would be interesting to know how the so-called safety match has improved matters. It is also worth pointing out that the electrical system should have the credit for doing away with matches, so far as it is concerned. Certainly, those systems which require a match for lighting should be charged, in part at least, for the risk which the match itself introduces.

Part of the report deals with the feeling on the part of the central station people respecting the publication of lists of the electrical fires alone. In general, this is thought to be unfair; and there is still a feeling on the part of the public that electricity is especially dangerous and that these figures encourage this feeling. It would be better not to publish electrical statistics alone, but to publish simultaneously statistics dealing with all illuminants. There is, of course, some ground for this position. Electricity is still a wonderful and fearful thing to many. It works quietly and makes its presence known only by doing work or by producing light. The manner of producing it and distributing it to the point where it is to be used is little understood, and just as the layman is willing to believe almost anything possible to it, so he is willing to attribute unknown dangers. This feeling works to advantage in some ways, as most people are inclined to leave electrical wiring alone; but, on the other hand, they are unable to tell when electrical work is being done properly, and this is, of course, a disadvantage. The insurance companies are interested in improving all fire hazards, and they can not be criticized for taking any fair means for doing so, and it is their duty to see that all wiring in buildings which are to be insured be properly installed. In other words, the inspection of electrical work of all kinds is one of their important duties, and in this work they should have every assistance that the central station people can render. The two interests should, and do, cooperate in this work, and even when the insurance people are not directly concerned, the central station should, on its own account, require that the wiring system be safe before it will connect it to its supply. This does not necessitate elaborate and fancy work in all cases, but good

work is essential. The electrical hazard as it is now seems to be unsurpassed, but, as mentioned before, the statistics are not entirely satisfactory, because they do not give any idea of the relative use of the apparatus giving rise to the hazard; yet it seems probable that even were these figures included in the tables, that but little good would be accomplished. The general public is not going to take the trouble to study such figures in order to arrive at an understanding of the risks. It is more than likely to take the word of the last man who spoke. And this brings up another phase of the problem—that of educating the public in the use and care of electrical apparatus; in fact, the more it knows about the system of production, distribution and utilization of electrical power, the less likely is it to abuse the apparatus with which it comes in contact and to take the word of every man who carries a screw-driver and a pair of pliers.

AN UNGROUNDED WIRELESS RECEIVING CIRCUIT.

Usually, receiving and transmitting systems for wireless telegraphy are connected either directly to the ground or through a condenser, or in such a way that the system itself acts more or less as a condenser with the ground surface; and such systems depend for their action upon the differences in electrical potential set up at the receiving station by the generating apparatus, and in the receiving system by the electrical waves cutting the antennæ. Such systems must therefore, in general, be high, in order to transmit and receive comparatively large amounts of energy. On another page of this issue an interesting system is described by Mr. Greenleaf W. Pickard, which is not grounded at all, nor does it utilize for this purpose the condenser effect of the system with respect to the earth; in fact, the operation of the receiving circuit does not depend upon the differences in electrical potential set up, but upon the electromotive forces induced by the magnetic waves which cut it. The system is thus peculiar, in that it is affected not by electrical potential differences, but by the magnetic waves which follow the latter a quarter of a phase later. To utilize this magnetic component of radiation, which, of course, is in the form of enlarging circles starting from the radiator, it is only necessary to construct a transformer secondary which will include a sufficient number of these lines to actuate the receiving apparatus; and this may be done by giving the receiving circuit a sufficiently large area, which also may be accomplished by using a long rectangle instead of a high one. This is a feature of considerable practical advantage, and Mr. Pickard's experimental results seem to show that a sufficient effect may be secured even with rectangles of relatively small area.

Another feature of this peculiar system is its selective action —selective for direction, that is, for, of course, if the magnetic waves cut both sides of the rectangle at the same time and in the same sense, the resultant electromotive force will be zero—that is to say, if the plane of the rectangle is tangent to the magnetic lines, the apparatus will not respond to them; while if it cuts them normally, the effect will, of course, be the greatest. This effect may be made use of to determine the direction in which the signals are coming, and it seems that this may be done fairly accurately, as the zero point of the system appears to be sharp. Such a device should therefore be of considerable value on shipboard in locating signaling stations, and for this purpose the ability to do so with a comparatively small receiving rectangle is an advantage of considerable importance.

In his description, Mr. Pickard gives some details of the method of adjusting it, and some results of actual tests of this interesting system, which promises to be of considerable value.

LUBRICATION.

A phase of operating engineering which is too frequently slighted is that of lubrication. Not that sufficient lubrication is not secured, for that must be done, else the apparatus breaks down. But the expense at which this lubrication is obtained is too frequently excessive. In the early days the operating engineer usually purchased a special oil with a fancy name, and paid a correspondingly fancy price. He had used this oil, or it had been recommended to him, and he was confident that it would give satisfaction, and he dreaded making any experiments. And in those days the methods of lubricating journals or other moving parts were more or less crude. The old sight-feed oil cup was the standard device. This called for constant attention from the operators, both to see that it was kept full and to catch the waste oil. Besides, it was dirty and wasteful. Even after the self-lubricating bearing was introduced in some dynamos and motors, it was years in making its way, although it possesses many advantages.

It is a good sign that more attention is being paid to this subject now, and an article in the current issue of the *Engineering Magazine*, by P. F. Walker, an abstract of which appears on another page of this issue, is interesting and to the point. Large central stations to-day are purchasing their oil on specification, and are getting what they want at reasonable prices. They are also determining when to use oil and when grease, and are getting out of the old ruts; but there is still a good deal to be done in this direction. Tests for viscosity and flashing point, and the percentage of animal fat, are those most frequently made, and these, in fact, are necessary to determine whether the company is getting the oil that it calls for. But, no doubt, it is often true that although the company gets what it wants, it is not using what would give the best results. Tests for determining the friction coefficient and other properties which indicate the value of the oil as a lubricant should be made, and upon these the chemical specifications should be based. It is these features upon which particular stress is laid by Mr. Walker, and they are well worthy of receiving the attention of all those who purchase lubricants.

The Thirtieth Convention of the National Electric Light Association.

New Willard Hotel, Washington, D. C., June 4, 5, 6 and 7.

THE thirtieth convention of the National Electric Light Association was held at the New Willard Hotel, Washington, D. C., June 4, 5, 6 and 7. This convention was successful from every point of view. There were nearly 2,000 delegates and guests registered, and all of the sessions were largely and enthusiastically attended. The registration arrangements, under the direction of Miss Edith M. Myers, were well carried out, and the policy of registering a large number of delegates in advance facilitated this work of the convention.

The formal sessions were opened on Tuesday morning, June 4, when President Arthur Williams called the convention to order and introduced Gen. George H. Harries, vice-president of the Washington Railway and Electric Company, who addressed the members briefly, and then introduced the Hon. H. B. F. McFarland, president of the Board of Commissioners of the District of Columbia, who welcomed the delegates to the capital city. Mr. Williams delivered his annual address, a copious abstract of which appeared in the issue of the ELECTRICAL REVIEW for last week. The sessions of Tuesday and Wednesday were also reported in that issue, the following papers having been taken up: Report of Committee on Progress, T. C. Martin; "Accidents," Paul Lüpke; "Power-Factor Correction," F. D. Newbury; Question Box, Paul Lüpke, editor; Report of Committee on Electric Light Accounting, H. M. Edwards, chairman; "Legal Justification for Differential Rates," George Whitefield Betts, Jr.; "Recent Developments in Mercury Rectifiers," Frank Conrad; "Recent Developments in Protective Apparatus," D. B. Rushmore; Report of Committee on the Fire Hazard of Electricity, C. E. Skinner, chairman; Report on Insurance and Kindred Matters, W. H. Blood, Jr., chairman; "New Developments in Arc Lamps and High-Efficiency Electrodes," G. M. Little; "Indefinite Candle-Power Ratings in Municipal Contracts," E. Leavenworth Elliott; "Indefinite Obligations in Municipal Contracts," Henry Floy; Report of Committee to Consider Specifications for Street Lighting, Dudley Farrand, chairman; Report of Committee on Present Methods of Protection from Lightning and other Static Disturbances, Alex Dow, chairman; "Electric Heating without Special Concessions from the Central Station," C. D. Wood, Jr.

WEDNESDAY EVENING SESSION.

The first paper of the Wednesday evening session was presented by E. A. Norman, entitled "Efficiency of Various Methods of Illumination."

The author considers that from an aesthetic standpoint, with the possible exception of hall rooms, assembly rooms, etc., a room lighted with uniform intensity is not desirable. It is not necessary to illuminate every niche and corner. Shadow must exist to display form, to relieve monotony and give depth. It is not alone sufficient to know the area of a room to prescribe certain illumination. The decorations must be carefully considered. A wall of one tint will absorb more, and consequently reflect less, light than will a wall of another color. In addition to this, the color scheme of the room must be considered, as lights of different colors will change the color value of the decorations. The author discusses various phases of lighting with different forms of illuminants, and gives the results of some tests conducted by the Electrical Testing Laboratories, New York city, on the lighting of the Harlem office and the drafting room of the New York Edison Company.

V. R. Lansingh, discussing this paper, emphasized the importance of the services of an illuminating engineer as a valuable adjunct to a central station. He called attention to one particular installation in a large department store, where it had been decided to put in gas arcs in preference to electric arc lamps. The services of an illuminating engineer were secured to see what could be done toward getting an economical layout with electrical incandescent lamps. The result of the illuminating engineer's work was that electricity was used for the lighting of this store, gas being thrown out entirely.

The paper by Dr. A. E. Kennelly and S. E. Whiting, entitled "The Frequencies of Flicker at Which Variations in Illumination Vanish," was presented.

This paper describes a series of tests to study the effect of a flickering light by means of a photometer, the object being to determine the relation between the frequency and the intensity of the illumination, and the effect upon the eye. The measurements were made in a photometer room with dark walls, the flicker being produced by a rotating sector disc placed in front of a steady and stationary incandescent lamp. The opening in the disc could be varied in area so as to increase the time during which light fell upon the screen. The frequency of the flicker was varied by changing the speed of the motor and by using discs having different numbers of openings. Tests by means of a number of observers watching simultaneously showed that there was substantial agreement upon the frequency at which the flicker disappeared. Experiments were made with screens of different color, and also by allowing light from a second lamp to fall upon the screen, so that it was continuously illuminated, the flicker being superposed upon the steady illumination. There is also an appendix to the paper, which shows that the observations conform substantially to the Weber-Fechner law of sensation and stimulus.

This paper was discussed briefly by P. O. Keilholtz.

J. R. Bibbins then presented his paper, entitled "Application of Gas Power to Central Station Work."

The author outlines several plans of power stations, exhibiting present practice, recent improvements and efficiencies. The majority of plants established are polyphase plants, involving parallel operation on fluctuating load. Three of these plants operate on natural gas, the remainder on manufactured gas, either producer or by-product.

The paper entitled "The Future of the Gas Engine," by Lewis Nixon, was read.

There being no discussion on these papers, the lecture by Dr. C. P. Steinmetz, on "Lightning and Lightning Protection," was delivered.

A nominating committee was appointed as follows: John F. Gilchrist, W. W. Freeman, Percy Ingalls, Henry L. Doherty and J. E. Montague.

The meeting was then adjourned until Thursday morning.

THURSDAY MORNING SESSION.

President Williams called the meeting to order at ten o'clock and called for the paper entitled "Producer Gas Engines for

Central Station Work," by Robert T. Lozier.

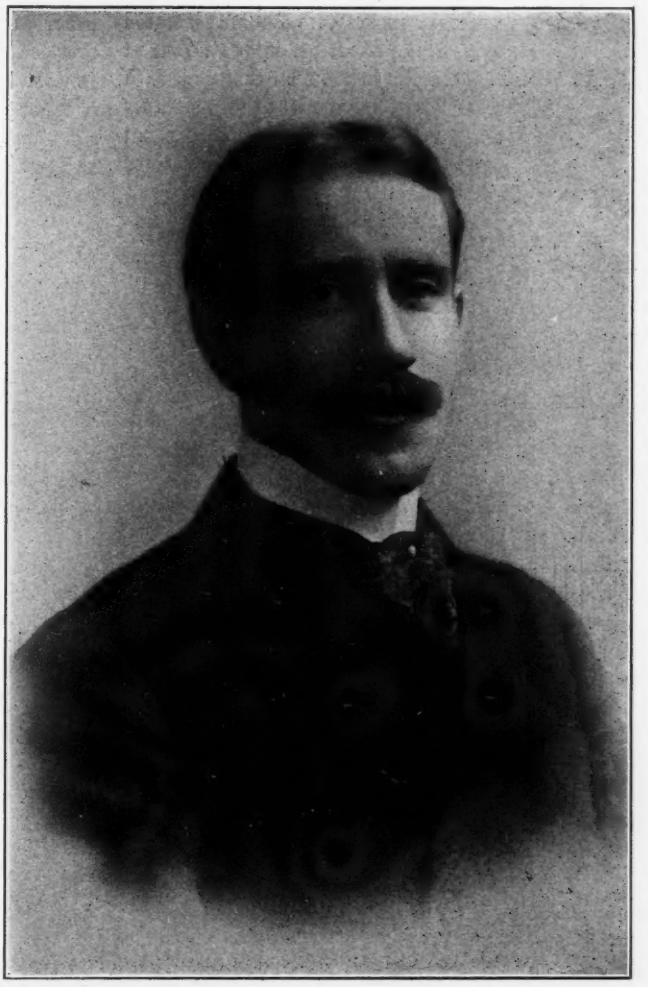
The author takes up the subject under two heads—first, fundamental principles upon which the gas engine and producer work; and, second, the application of this apparatus to central stations. The first part explains the action of this apparatus and why its thermal efficiency is high. Results are given showing the actual performance of such plants. Turning, then, to the reasons why such apparatus should be advantageous in central stations, three conditions of service are considered: first, the adoption of such power apparatus for a moderate-sized central station about to be projected; second, the advisability of replacing an uneconomical station with such apparatus, and third, the addition of gas engines and producers to a large existing central station in order to carry the overload. Calculations are given for each to show what the cost of power will be. The author concludes that the conditions best suited to gas-engine operation are those of high load-factor, because it is in this respect that the gas engine is able to make its biggest saving and offset possible high interest and depreciation charges because of its higher first cost. This can, of course, be determined for each instance by working out an equation in which all elements are included.

L. A. Ferguson asked Mr. Lozier how much space would be occupied by a gas-engine substation of, say, 1,000 kilowatts capacity. It occurred to him, that inasmuch as in large cities, where the substations are ordinarily used, the substations are located in those parts of the city where land and buildings are very expensive, that the cost of the space occupied should enter into the discussion. He also raised the question as to what would be the comparative figures with the cheapest grade of coal, costing somewhere in the neighborhood of $1.25 per ton, instead of high-grade coal at $3 per ton.

P. O. Keilholtz asked if Mr. Lozier had made any analysis of the angle of variation of gas engines, or if the analysis has not been made, if it had ever been determined.

Mr. Lozier, in reply to Mr. Ferguson's inquiry concerning the space occupied by the substation plant, said he purposely limited the substation to 1,000 kilowatts, so as to get it in a small space and make it available for substations. He does not advocate necessarily the use of gas engines for substations, but thought possibly that this method might prove interesting to work out as to whether or not it would pay. He believes it will for these substations. A plot of ground 40 or 50 × 100 would amply take care of a 1,000-kilowatt substation. He figured from this particular case, and took the precaution to get the price on a two-mile cable to supply 6,000 kilowatts, and with the underground conductors it would cost $80,000 for the cable alone. By putting these values in an equation, interest on the investment, etc., you could work out whether or not a substation of that kind would pay.

As concerns the question of six pounds of coal for a 500-kilowatt plant and three pounds of coal in the other case, he is frank to confess that unless you are putting in a gas engine to take the place of a very inefficient steam plant, due to the low load-factor of a lighting substation, you have got to figure the thing on the local conditions before you can state whether or not the gas engine will pay. Many stations are running on six pounds of coal per kilowatt-hour. In the case of the substation referred to, he took the limit he thought he could safely go to, three pounds of coal, because that is a large waterside station of many thousands of kilowatts.



MR. DUDLEY FARRAND, PRESIDENT, NATIONAL ELECTRIC LIGHT ASSOCIATION.

E. H. Davis then presented the report of the Committee on Freight Classification.

Mr. Davis did not read the report in full, but said with regard to the question of freight classification and freight rates on materials either manufactured or used by members, that it was decided, considering the question from the broadest point of view, that the most advantage could be derived by first attempting a universal freight classification, since in most of the articles there are different classifications in these several jurisdictions, and the result will be that practically most of the articles will in all probability receive a lower classification, which in itself will amount to a reduction in the freight rate. As regards the reduction of the classification on any particular article, the committee found it such a difficult problem to handle that it makes no special recommendation, except that if in an undoubted case application was made to the association for relief, the association would undoubtedly contribute its full share of work in correcting the difficulty. He therefore suggested on behalf of the committee and for the good of the association the passage of the following resolution:

"Resolved, That the National Electric Light Association favors and approves of a system of universal freight classification; and that a copy of this resolution be forwarded by the secretary of this association to the Interstate Commerce Commission, with the request that such universal freight classification be adopted."

The resolution was unanimously adopted.

The next paper on the programme, "Re-

cent Turbine Developments," was read by the author, W. L. R. Emmet.

The author traces the development of the Curtis turbine, and indicates the efficiencies at which present plants are operating. A comparison is drawn between a 5,000-kilowatt, four-cylinder compound engine and a 5,000-kilowatt, five-stage Curtis turbine operating under similar conditions. The author concludes that the showing of the turbine is considerably better in every direction than that made by the reciprocating engine.

P. H. Kemble, Windsor Locks, Pa., asked Mr. Emmet in reference to the lack of economy of the turbine in the smaller sizes, how small a turbine he would recommend for the use of a small station, as against the Corliss engines, where the capacity of unit would not be over 250 kilowatts.

E. J. Richards, Newburgh, N. Y., said the figures which had been given applied to large stations, of which there are comparatively few in the country. He asked what we may be led to expect in units of 500 and 750 kilowatts, compared with the large units, in the way of economy.

J. R. Bibbins, Pittsburg, Pa., in regard to the comparison which Mr. Emmet had made between the turbine and the engine at the Manhattan station, New York, asked him if he had correctly determined the results to make them comparable in reference to the engines for superheat and vacuum, and if so, what curve, what percentage of curve, he had used in bringing the results to a comparable basis.

B. S. Josselyn, Baltimore, Md., asked what the greatest degree of efficiency is that has been obtained by the Curtis turbine in pounds of coal per kilowatt-hour output with the very best degree of anthracite for that purpose.

Lawrence Manning, Owosso, Mich., asked what had been the best efficiency actually obtained at full load of 300 and 500-kilowatt turbine units, as now manufactured; that is, at 150 pounds steam pressure, with and without 100 degrees superheat.

In reply Mr. Emmet said that with 250 kilowatts output on a condensing turbine, with twenty-eight inches of vacuum, twenty-three pounds per kilowatt-hour could be used per hour. The three large engines in Schenectady, his paper stated, use thirty-four pounds per hour, condensing. Since he wrote this paper he had read the tabulation in a book published by Mr. Barris of a number of engine tests in commercial service, which he has made, and from them a curve could be made of steam consumption under commercial conditions, and from his figures it would appear that the thirty-four pounds at Schenectady, which he considered preposterous, was not unusual, but that few of the engine plants tested had less than twenty pounds per kilowatt-hour, and that on small sizes, in fact, on all sizes throughout the range, they were running fifty per cent above the turbine. With regard to 300 and 500-kilowatt machines, he would say that in the 500-kilowatt, four-stage machines his company is now making, the steam consumption, with twenty-eight inches of vacuum, saturated steam, is 19.5 pounds per kilowatt-hour at full load, and a little better than that with different loads. He thought that machines that are now coming out would be about a pound better than this. In the case of the 300-kilowatt machine he should say while nearly as good results could be produced they would probably be two pounds higher.

With reference to the effect of superheat and vacuum in these results, he said that in the engine and turbine comparison, which he had made in one of the curves, the engine was running with twenty-eight inches vacuum, there being good vacuum conditions in the station. The turbine shows a somewhat higher degree of vacuum, because the vacuum is obtainable with the turbine, but with the engine no increase of vacuum above twenty-eight inches would improve the engine the slightest degree. The turbine curve is based on 28.5 vacuum, which he considered a conservative figure. The question of pounds of coal per kilowatt-hour in station operation, of course, depends on station management of boilers, the load-factor and a lot of other conditions. The results actually being produced in Chicago are the equivalent of 1.8 pounds of good coal per kilowatt-hour—that is, with all the standby losses, all the waste and imperfection of combustion, a rather low average efficiency. If they were burning good coal with similar combustion efficiency, they would be running at about 1.7 pounds per kilowatt-hour. The indications are that with such a load-factor as is had in Chicago, with perfect conditions as to combustion facilities and firing and distribution of load, they could get down with good coal to below 1.5 per kilowatt-hour, which is equivalent to one pound per indicated horse-power on an engine. The effect in all his company's turbines with superheat is practically one per cent reduction in water rate for 12.5 degrees of superheat, but it must not be assumed that this is all gain, because it costs money to produce the superheat, and that is also an uncertain and variable amount, depending on local conditions.

The next paper on the programme, "Balancers *vs.* Three-Wire Dynamos," was read by the author, B. Frankenfeld, of Cincinnati, Ohio.

The author discusses the use of the three-wire dynamo for equalizing the potential on the branches of the three-wire system, comparing this with balancers employed for the same purpose. He concludes that the former machine can not be regulated for equal voltages, while the latter can, and can also carry a neutral overload with much better results. An objection to the three-wire dynamo is that it represents extreme specialization in design. It is complicated, requires expensive switchboard connections, and there is danger of a violent short-circuit when it is brought up to speed and paralleled. The three-wire dynamo must be placed in the station, while the balancer can be located at a distance. Lastly, it is emphasized that the balancer is not limited to isolated plant service, but is capable of much heavier duty.

There being no discussion, the next paper, entitled "The Effect of Frosting Incandescent Lamps," by Dr. Edward P. Hyde and F. E. Cady, was read by Dr. Hyde.

The paper entitled "Some Power Experiences," by Miss S. M. Sheridan, Detroit, Mich., was read by Alex Dow.

This paper details several experiences with regard to the sale of current for lighting and power, and analyzes the results of this experience, which applies to the average small central station.

The meeting then adjourned until Thursday evening.

THURSDAY EVENING SESSION.

President Williams called the meeting to order at eight o'clock, and called for the report of the chairman of the Membership Committee, J. Robert Crouse.

Mr. Crouse reported that the gain in membership in 1906 was 176; the gain since March 1, 1907, 243; increased revenue from new members in 1907, $5,465. Present membership: Class A, 96; B, 121; D, 18; E, 8. Total membership at date of report, 1,233.

Mr. Crouse was given a hearty vote of thanks for the successful work he had accomplished.

The paper entitled "The Electric Automobile as an Adjunct to Central Station Loads," by H. H. Rice, of Indianapolis, was read.

The author considers that central station managers do not push the sale of cur-

rent for charging electric automobiles with the same energy they apply to the installation of electric signs, to the use of domestic heating and cooking appliances. Most of the charging could be done at a period when it would be extremely profitable to the central station, and rates could be made which would attract considerable business. One of the reasons why the electric automobile has not forged ahead is the lack of facilities for charging which ordinarily exists.

James I. Ayer, chairman of the Committee on Electric Heating and Cooking, reported that the committee, in considering what should be presented at the meeting, concluded to have one of its members, C. D. Wood, Jr., present a paper which had already been read, which covered some of the aspects of the situation.

Charles D. Robinson, on behalf of S. R. Bradley, Jr., of Nyack, N. Y., chairman of the Committee on Relations with Local Associations, presented the report of that committee, which showed that the committee had corresponded with the various state and territorial associations, with a view to general cooperation in matters of interest to the state and national associations, and the committee recommended that the state associations should confine themselves in their work to matters of local and state interest, and leave the discussion of technical subjects to the main association.

W. W. Freeman moved that the report be received and the committee discharged, with thanks, which motion was carried.

The report of W. H. Blood, Jr., chairman of the Committee on the Grounding of Alternating-Current Circuits, was presented.

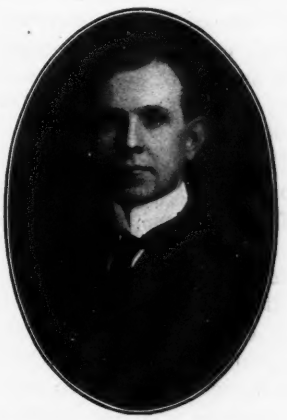
Mr. Blood said that the general feeling throughout the country is that the secondary alternating-current circuits in general should be grounded. There is considerable difference of opinion as to just what voltage should be grounded, just what voltage should be insulated, and the matter of handling polyphase circuits is particularly indefinite at the present time.

In reply to several questions Mr. Blood said that the committee has not yet attempted to make any tests of the various methods to be employed; it has only recently been appointed. The committee is one of conference with the other committees which have been appointed, the idea being that between now and next March a suitable method for grounding will be found, based on the experience of the members, and a certain definite recommendation could be made to the underwriting interests at that time.

The secretary read letters of regret at their inability to be present at the meeting from the following gentlemen: W. H. Merrill, Jr., C. A. Coffin, P. G. Gossler, George Westinghouse, Thomas A. Edison, C. S. Littlefield, H. C. Hazzard and H. H. Crowell.

The report of the Committee on Relations Between Manufacturers and Central Stations, of which Mr. Henry L. Doherty, of New York, is chairman, reported progress.

General George H. Harries then addressed President Williams, and after a few happy expressions of felicitation, presented Mr. Williams with a gavel made from wood saved from the doors of the old Senate chamber. The gift was presented on behalf of the exhibitors and was accepted by Mr. Williams with expressions of deep gratitude and appreciation.



Mr. W. W. Freeman, Secretary and Treasurer, National Electric Light Association.

The report of the Committee on Public Policy was then presented by Mr. Everett W. Burdett. The following subcommittee reports were presented: Municipal Ownership, Alex Dow; Public Regulation and Control, Samuel Scovil; London Sliding Scale, as Applied to Electricity, Charles L. Edgar; Taxes and Franchises, Henry L. Doherty; Industrial Insurance, Awards and Pensions, John B. McCall; Publicity and Popular Education, Samuel Scovil read the report, which he said had been prepared by Mr. Lieb.

There was then a general discussion, which was participated in by E. W. Burdett, Isaac P. Smith, H. L. Doherty, W. H. Gardiner, E. N. Wrightington, J. J. Burleigh, A. J. DeCamp, Philip Torchio, E. H. Davis, G. V. S. Michaelis, Samuel Scovil, A. A. Dion, M. S. Seelman, Jr., Dudley Farrand, W. W. Freeman and Howard T. Sands. The meeting then adjourned until Friday morning.

FRIDAY MORNING SESSION.

President Williams called the meeting to order at ten o'clock. The first paper, contributed by Guido Semenza, of Milan, Italy, on "Italian Methods of Charging for Electric Current," was read by Louis A. Ferguson.

This paper discusses the methods of charging for electric power in use in Italy. In the northern part of that country, where hydraulic power is available, the flat rate largely prevails; in fact, this method is more used than any other in Italy. Certain companies have, however, adopted a sliding scale, the charge varying with the amount of power used during the year. The Milan Edison Company, finding it inadvisable to use a flat rate, has introduced meters and a maximum-demand system of charging. The author then shows how a satisfactory sliding scale may be worked out, which, he believes, leads to equitable charges.

After reading the paper Mr. Ferguson said he thought it would be advisable to have a discussion here of the necessity of obtaining some meter that would measure the true energy on polyphase service for general service, not for large customers, but general motor service. He noticed in this paper some of the points he intended to bring out at the convention, viewed from a somewhat different standpoint. This whole subject of charging for alternating power service was very important. The use of alternating-current service for industrial power is growing tremendously all over the country, and this is especially true in the large cities and also in those sections of the country where water power is available, but at the present time it is difficult to deal with the customers on a differential system. If you are selling on flat rate per kilowatt or horse-power per year, of course there is nothing to consider, but there are some who believe that at least where steam power is the source of supply, a flat rate per kilowatt-hour, or kilowatt-year, is not an accurate system, and the differential system should be used, so as to avoid difficulties with customers in making comparisons with their costs. On a differential system, every one pays exactly on the same basis. The difficulty is there is no means of measuring the maximum demand. A number of experiments have been made in Chicago to ascertain whether the Wright indicator could be used for this purpose, and it has been the practice to sell alternating-current service on a sliding scale of prices, so much per kilowatt-hour, but it is desired to ap-

ply the maximum-demand system to this service. Some experiments were made with the Wright indicator and the conclusion was arrived at that it could not be used. On reason is that the power-factor of the different phases is not the same, and therefore you can not simply take the indication of one phase, and assume that is the maximum demand for the entire installation. The contract department objected very seriously to the method of charging, which involved charging for the idle current, that is charging on the basis of the kilowatt-amperes, because it put the customers' bills so high that they were forced to try to find some method of charging that would be fair to alternating-current, as well as direct-current customers.

Howard T. Sands, Haverhill, Mass., said he did not believe it was right to impose upon a customer the demand charge, when from eighty to ninety per cent of that demand can be reduced in the sharp peak of a load lasting for only a matter of five or six minutes. He had served his purpose by forgetting all about power-factor, and simply taking seventy-five per cent of the volt-ampere reading of the demand indicators and charging for the demand at the primary and charging the balance at the secondary rate.

Peter Junkersfeld, Chicago, said that polyphase circuits are nearly always unbalanced, and for that reason the ordinary demand indicator gets us into difficulties right away. There may be a very large percentage of difference of current in the three legs of the system. Perhaps the simplest way is to forget the power-factor at the time, but not forget it at the time of fixing the rate, doing so in the interest of simplicity. In supplying large railroad systems, where there are hundreds of cars and the load-curve shows no sharp peaks, the average demand for one hour does very well, but for industrial power or interurban railways, where the peaks are sharp, that works a hardship on the company. It is another way of reducing the price, so that in this case it would be fair to the company and more equitable to both company and consumer to use the average demand over a fifteen-minute period.

Philip Torchio, New York, said that those who supply light from central stations are very much interested in the power-factor, not only for the reason that they do not want to overload the cables, transformers and generators, but also for keeping the regulation good, and with low power-factor, the regulation, of course, becomes very bad. The manufacturer ought to be impressed with the fact that induction motors must be made with the best power-factor that can be had, and if the motor can not be made with a good power-factor, at least the controlling and starting devices be made to reduce the inrush current to a minimum. In an instance where his company was asked to bid on very large motors to supply water-pumping stations, motors of about 800 kilowatts each, it was made possible to start the pumps under full head, and still not have an inrush current more than fifty per cent of full-load current, and that is all arranged by proper resistance in the starting.

R. W. Rollins, Hartford, Ct., asked Mr. Ferguson whether his company was basing its calculations on the results of its experience on the direct-current system, based on 10,000 horse-power. It would be interesting to ascertain the relation of the maximum demand to the full 10,000 horse-power rating.

Mr. Ferguson stated in reply that the Chicago Edison Company had made a study of 10,000 horse-power total of 2,000 motors, on its alternating-current system, and found that the average of the business, that is ratio between the maximum load and connected load, was sixty-four per cent, but this varies a little from conditions. Where a customer has one motor, the ratio between maximum load and connected load is higher than where there is more than one motor installed, and therefore the two must be differentiated. If a man has fifty one-horse-power motors they would not all be used at once, whereas if he has only one fifty-horse-power motor he is using it all the time. It was found to be better to make the classification according to horse-power.

H. T. Hartman, Philadelphia, thought that the proposition advanced by one of the speakers that the peaks integrated over a half hour or hour should be taken as a fair average seems entirely too high. Take for example an elevator load. If its maximum over a period of an hour or a half hour were taken as the average, the allowance would be entirely too little. The Niagara Falls, Lockport & Ontario Power Company has recently installed a very large transmission system, and it has adopted as an average the one-minute peaks over the month, and the thirty highest one-minute peaks are taken as representing on the average the demand for which it must charge in order to get a sufficient amount for its fixed charges.

Closing the discussion Mr. Ferguson moved that a committee on meters be appointed by the president to investigate the whole subject of meters, with especial reference to the particular subject which had just been discussed.

This motion was carried. The report of the Committee on Standard Rules for Electrical Construction and Operation was presented by E. H. Davis, chairman.

The report stated that the committee had but little to do during the past year; that the relations between the two interests were on a more harmonious footing, which it was hoped and expected would continue and improve. Reference was made to the proposed amendment of Rule 13-A, but the report stated that no action had been taken on these proposed changes, and it was arranged to have the matter referred to a committee of the Underwriters' National Electrical Association which should confer with the National Electric Light Association, the American Institute of Electrical Engineers, the Association of Edison Illuminating Companies, and the International Association of Municipal Engineers, and a motion was passed to receive the report.

President Williams announced as the Committee on Meters the following: L. A. Ferguson, Chicago; Alex Dow, Detroit, and J. E. Montague, Niagara Falls, with power to add to their number.

COMMERCIAL OR NEW-BUSINESS PROGRAMME.

W. W. Freeman took the chair and called upon the originator and moving spirit of cooperative electrical development, J. Robert Crouse, who read the paper entitled "Cooperative Commercialism in the Electrical Field."

Mr. Crouse stated briefly the objects of the cooperative movement, and discussed the theoretical and practical aspects of the plans under way. He sketched the work of the representatives in the field, and outlined the plans for having representatives on a joint committee of the manufacturers, contractors, architects, builders and the technical press. Cooperation is also had with advertising agencies, and a plan was advanced for the establishment of a national commercial press bureau. The results, as summarized from reports from 934 central stations, showed that many had organized new-business departments, added solicitors, begun direct-by-mail advertising, begun newspaper advertising, increased advertising appropriation, opened up display and demonstration rooms, and hung out their own electric signs. This amounted in the aggregate, for 1907, to an expenditure of $871,347.50. With the reasonable assumption

that it has been continued for the five months of 1907, it would now aggregate $1,234,408.95. Allowing forty-five cents as a liberal estimate of the cost of securing a sixteen-candle-power equivalent of new or added business, this would result in 2,743,131 sixteen-candle-power equivalents, or 137,156.55 kilowatts. As an indication of the probable gain through this service, it is stated that the gain in lamp sales for the country at large was five per cent in 1904 over 1903, eight per cent in 1905, twenty per cent in 1906, and so far this year more than twenty-five per cent over the corresponding period in 1906.

The report of the committee to assist in the further development and prosecution of the plans of the Cooperative Electrical Development Association was also presented, and an appendix to the paper, including the constitution and by-laws of this association.

J. F. Gilchrist read the report of the National Electric Light Association Cooperating Committee.

The following papers were then read: "Possibilities of Commercial Development," Henry L. Doherty, New York; "New Business—How to Get It—How to Keep It," F. M. Tait, Dayton, Ohio; "New-Business Results Demonstrated in Cities of All Sizes," J. E. Montague, Niagara Falls; "Sales Policy in Combination Gas and Electric Companies," F. A. Willard, Rochester; "Cooperation of the Electrical Trade Papers in Business-Getting," by Mr. F. W. Loomis, Savannah.

POSSIBILITIES OF COMMERCIAL DEVELOPMENT.

HENRY L. DOHERTY.

We have already reached the commercial age. Each day the commercial end of our business assumes greater and greater importance. The aggressive work being done by many central stations in the country has created a new standard of lighting, and while it is possible for the other central stations to do nothing and still reap some benefit from the work of others, it is now possible for a small expenditure of money and effort to bring splendid returns in the field of development of business.

It is by concerted effort of all central stations that the greatest development can be secured. Some jealousies have recently sprung up between the engineering branch of the business and the commercial branch of the business, but I see no reason for this, as each has its proper sphere, and I see no reason why the engineer can not take up new-business work, if he chooses to do so, and feel that with the same qualifications he is better equipped to realize success than the man lacking in the special technical knowledge of the business.

We used to talk about the point of saturation, meaning that time when we should have sold all the light and power that could be sold in a given city. If there is such a thing as the saturation limit we have not yet found it. I can say truthfully that the longer we carry on the development of work, the more easily additional business is acquired and the more business there is still in sight. We are now taking on business in some of the stations with which I am connected at a greater ratio each year than the entire business of any central station amounted to when I first became interested in the subject of development of the market.

NEW-BUSINESS RESULTS DEMONSTRATED IN CITIES OF ALL SIZES.

J. E. MONTAGUE.

A review of the commercial department of central station fields during the last few years, and particularly the last two years, makes it very apparent that this subject must command constantly-increasing attention from all electrical interests.

In the face of the fact that $2.50 per capita income from the sale of electric current was the average according to the last census, the fact develops that where central stations take up seriously and aggressively the new-business methods under discussion, the per capita sales have been and can be increased to from $5.00 to $8.50, and even $12 per capita, in cities of all sizes and conditions.

The results of the commercial departments of many central stations indicate the following interesting facts:

First—That the per capita incomes in such stations rapidly pass the average of those where live, active interest is not taken in the commercial development.

Second—That expenditures of from three to five per cent, and even more, of gross income on business extension along proper lines is fully justified by the results. This percentage of expenditures, it will be noted, is very small as contrasted with more competitive lines of business.

Third—That the load-curve is very materially improved, and in consequence the ratio of gross income to operating expense.

Fourth—That central stations which have operated these commercial departments for two or three years, or even longer, do not, as at first might be expected, reach the point of business saturation, but continue to maintain the rate of increase through educating the public to higher standards of service and through the introduction of new devices and appliances.

Fifth—That aggressive commercial departments are the most important factors in the cultivation of improved relations with the public and have in numerous instances been worth to companies all they cost from this standpoint alone. We should soon reach—if, indeed, we have not already reached—the point where the commercial engineer in his work of creating and extending the business will be entitled to take equal rank and importance with the electrical and mechanical engineer in the perfection of his work of producing, generating and distributing apparatus and the reduction of current cost. It would seem that the mechanical and electrical engineer should welcome the advent of the commercial engineer, since the efforts of the latter are directed to extending the field of operation of the former and toward introducing more largely the comforts, conveniences and benefits of the entire art.

P. H. Campbell, Windsor Locks, Pa., said that in one town of 7,000 inhabitants there is a large carpet mill employing 3,000 operatives. The bulk of these operatives live in tenements. In another town there are about 2,500 male operatives, in textile mills and paper mills, living either in small houses or tenements. What possible proportion of these are likely to be reached either with gas service or electric light service?

F. H. Plaice, New Bremen, Ohio, said his company is lighting eighty-five per cent of all the buildings in the town. Many of the customers receive as low as $1.25 a day. His company works on a demand system, based more particularly on the area to be illuminated rather than on the amount of lighting installed. The rate starts at twenty cents for the first 7.5 hours out of the thirty hours per month. It swings to ten cents for the second 7.5 hours, then nine cents for the next fifteen hours, or an average of twelve cents for the first one hour per day per month; then six cents for the second hour, three cents for the third hour, and after that two cents a kilowatt-hour for all current. The company uses gas engines and pays thirty-five cents a thousand for gas.

The following papers on the subject of wiring were read: "How to Get the Old Buildings Wired," F. H. Golding, Dayton; "How to Get the New Buildings Wired," J. Sheldon Cartwright, Knoxville, Tenn.

HOW TO GET THE OLD BUILDINGS WIRED.

F. H. GOLDING.

As a preliminary, a house-to-house canvass of the residential districts should be made, the information thus obtained to be compiled in card-index form, containing the street and number of each house, name of owner, name of tenant or tenants, means of illumination in use and if electricity is not used, whether or not the house is wired.

The head of the new-business department, being informed by daily reports as

to the progress the solicitor is making, should aid him with mailings of personal letters and literature pertaining to various lighting and power appliances for the home use.

If the solicitor is at first unsuccessful in interesting the prospective subscriber to the extent of lighting his entire premises with electricity, he should endeavor to secure an entering wedge in the shape of a cellar or porch light, an electric iron, sewing-machine motor, or any other appliance that he thinks will most appeal to his prospect, offering the free use of same for a thirty or sixty-day trial, provided the prospective customer will pay for the small amount of wiring necessary and for the current consumed.

A liberal use of small electric signs, scattered freely through the residential sections, and of illuminated billboards is a valuable adjunct to residential work. The signs should be of the picture-frame variety to facilitate handling, and should be changed to new locations twice or three times a year.

The company should be prepared, where conditions seem to warrant and the prospective customer's responsibility is assured, to offer a proposition whereby the installation of wires and fixtures may be paid for in instalments—weekly, monthly, or quarterly, as may be desirable.

The president of the Electrical Contractors' Association of the United States, James R. Strong, New York, spoke on the subject, "Cooperation of the Electrical Contractor in the Wiring of Buildings."

COOPERATION OF THE ELECTRICAL CONTRACTOR.

JAMES R. STRONG.

For the sake of brevity and greater clearness, I would divide the subject into three parts:

First—The wiring of buildings.

Second—Standardization of work, materials and appliances.

Third—The recognition of the trade relations of the several factors that enter into the electrical business.

Cooperation of the contractor under my first heading, means the perfecting of his own organization so that the detail work will be done by subordinates, and his own time may be devoted to following up his various forms of advertising and extending his business of wiring buildings.

The contractor and his organization have been cooperating for a long time along the lines of standardization in several ways:

With the Underwriters for the improvement and simplification of the National Code and its uniform interpretation.

With the manufacturers for the standardization of sizes of various fittings and appliances.

With various legislatures for the standardization of work by licensing and bonding the contractor.

With the architects for the introduction of uniform symbols for wiring plans.

Much has been written of late on the subject of licensing the contractor. It is not my purpose to go into this subject in detail, suffice it to say that experience has shown that where states or municipalities have enacted a law requiring the licensing and bonding of contractors no one thing has done as much to eliminate the irresponsible worker and dangerous work.

At first glance the matter of uniform symbols for wiring plans may seem unimportant, but the general interest aroused among architects, engineers and technical schools by its introduction demonstrates the necessity of standardization in this department. I am glad to announce that on May 20 the American Institute of Architects formally adopted our symbols with only two minor alterations, and hereafter they will be issued under the endorsement of both associations.

I come now to the third and last subdivision of my subject, *viz.*: "Recognition of the trade relations of the several factors that enter into the electrical business." In my opinion this cooperative association can do nothing of greater importance than to use its influence to draw lines of demarcation between the various interests here represented. If through the influence of this body it can be accomplished that the lighting company shall do no wiring, concessionary or otherwise, and shall not sell supplies at wholesale or retail; that the jobber shall do the wholesale business and sell to the retailer and not to the retailer's customers; that the contractor or retailer shall purchase through the jobber and confine himself to the retail and contracting business; then this Cooperative Electrical Development Association will have demonstrated beyond a doubt that there is reason for its existence, and its support will come from all in the trade and not as at present from a comparatively few manufacturers.

This paper was discussed by Lawrence Manning, Owosso, Mich.; Leon H. Scherck, Birmingham, Ala.; W. P. Engel, Defiance, Ohio; and George B. Stetson, New Bedford, Mass.

The paper on "Value and Use of Solicitor's Handbook," by R. S. Hale, was read.

VALUE AND USE OF SOLICITORS' HANDBOOK.

R. S. HALE.

The "Agents' Handbook" as used by the Boston Edison Company, is, to my mind, the most important aid to new-business-getting we have. We use the ordinary loose-leaf book of pocket size, either National Simplex 4,241 or Unimatic 7,752, and put in it all the hints, suggestions and orders touching the interests of the general agent's department. The general advice as to the qualifications and aims of the agent and the specific information about the company's business, which varies little from year to year, are printed in the regular way. Other details, regulations and explanations of particular points, are gotten out on a multigraph machine and distributed as occasion serves.

Last autumn I started a division of hints in which various arguments in favor of electricity, answers to points that are raised from time to time, and any points in the way of "ticklers" which serve to stimulate the agents' interest, are incorporated. These hints are put in a separate part of the book and are so arranged that it is clear that they are of only temporary importance.

The following papers were then read: "Sizing Up the Territory—Preparing the Lists of Prospective Customers," George Williams, Cincinnati; read by W. H. Gardiner; "Qualifications of Solicitors for Different Classes of Business," F. W. Frueauff, Denver.

SIZING UP THE TERRITORY—PREPARING THE LISTS OF PROSPECTIVE CUSTOMERS.

GEORGE WILLIAMS.

In an undeveloped district a hit-or-miss method may result in success, but with the progress of a campaign the importance grows for listing the possibilities systematically.

The rapid improvement in electrical appliances has made electric current an easy commodity to sell and has multiplied the prospects for sale. The retailer now has ample precedent regarding the merits of electrical advertising, and the resident demands an illumination for comfort rather than bare necessity for safety.

QUALIFICATIONS OF SOLICITORS FOR DIFFERENT CLASSES OF BUSINESS.

FRANK W. FRUEAUFF.

A representative of a company soliciting electric power is best fitted for this work if he has a technical knowledge of steam and electrical engineering. Many of the best prospects for the electric company lie in closing down isolated plants, and the representative in his work must be able to make an intelligent investigation of the plant in order to determine any possible saving to the owner in connecting with the central station. He must be able to figure the amount of coal used under present conditions and the saving if the lighting load is taken off; also to know the difference in labor cost under both methods.

The representative best fitted for sign and display work is the one who can set forth intelligently the value of electric advertising and publicity. He must be able to present his proposition as one of increasing the revenue of the merchant by an advertising expenditure.

A solicitor working on interior lighting is best qualified if he has a complete knowledge of illuminating engineering, thus knowing how to secure the best effects with the least outlay to the consumer. A solicitor without this training can accomplish little permanent result.

The solicitor working among builders

and architects must be fully alive to all the latest forms and devices for properly wiring and equipping a building, keeping in close touch with new classes of fixtures, switches, lamps, etc.

The most versatile of the solicitors should be the man who works among present users. He should thoroughly understand the reason for, and method of overcoming, any kind of local trouble.

The sphere of the woman solicitor with the electric light and power company seems limited. Her greatest value would be in advocating the installation of special appliances in the home.

The meeting then adjourned until two o'clock.

FRIDAY AFTERNOON SESSION.

Chairman Freeman called the meeting to order at 2.15 o'clock.

The following papers were read: "Advertising Results Demonstrated in Cities of All Sizes," E. S. Marlow, Washington, read by Mr. Mangam; "How to Measure Results and Pay Solicitors," Leon H. Scherck, Birmingham, Ala.

HOW TO MEASURE RESULTS AND PAY SOLICITORS.

LEON H. SCHERCK.

I believe that solicitors for electric lighting and power companies should be paid a fair salary, sufficient at least to cover living expenses, and in addition to this a commission to be based upon the net returns of the business that they have brought in; but I would allow a commission only on new business that remained on the company's books for a certain length of time, say at least six months, and would base this commission upon two things: First—The revenue for the new business for six months (referring to the new business brought in by the solicitor) in excess of a certain amount. Second—The revenue for this new business for six months in excess of a certain amount per kilowatt demand. The commission thus determined should be allowed but once, and only to those solicitors who are with the company at the time the commission is compiled. Just what the percentage commission should be and what the fixed amount in excess of which the commission should be allowed, will have to be worked out by each company, and even varied for different districts of the same city, as of course a larger percentage commission and a less fixed amount should be allowed in those districts in which business is hard to secure.

Before reading his paper Mr. Scherck said: "I suggest to the Executive Committee that in the future no papers be read at the conventions. We take up too much time in reading the papers, and there is not sufficient time for discussion. I think we would get better results if the executive committee should send these papers three or four weeks before the convention. Then we could study the papers and be prepared to discuss them at the meeting."

J. D. Kenyon, vice-president, Sheldon Schools, read his paper on "Increasing the Efficiency of the Sales Force."

E. N. Wrightington, Boston, Mass., said he believed thoroughly in paying solicitors on a commission basis. It offers that direct financial incentive which the average salesman seems to need in order to get the best results.

C. W. Lee, of Newark, N. J., then had projected upon the screen lantern slides illustrative of various forms of advertising literature used by the electric light companies throughout the country, which he described.

The following papers were then presented: "How to Make the Most of Newspaper Advertising," A. D. Mackie, Peoria, Ill.; "Measuring the Results of Advertising," M. S. Seelman, Jr., Brooklyn, N. Y.; "Value of the Service of the Advertising Agency or Specialist," Lawrence Manning, Owosso, Mich.; "Display Room and Demonstration as Business-Getters," E. R. Davenport, Providence, R. I.; "New Business by Indirect Methods," L. D. Mathes, Dubuque, Ia.

MEASURING THE RESULTS OF ADVERTISING.

M. S. SEELMAN, JR.

It is my conviction, founded on a long experience, that in any community where the seed has been sown, where an advertising campaign has been conducted along right lines and is being continued under adequate auspices and fairly favorable conditions, the advertising should be responsible for and produce, directly and indirectly, at least sixty per cent of the business.

To accomplish this result, however, there must be modern and progressive management on the part of the central station, and the employment in charge of the publicity department not of an advertisement writer, but of an advertising man. These do not grow on every tree and are worth real money when you find them, but they can be secured if you are willing to pay the figures offered by other lines for ability, equipment and experience of this kind. In advertising, more than in almost any other department of business activity, it is a true and trenchant fact that cheap men are dear at any price.

These papers were discussed by M. S. Seelman, Jr., and Lawrence Manning.

The following papers were read: "Co-operative Lighting of Streets by Merchants," H. J. Gille, St. Paul, Minn.; "Illuminating Engineering as an Aid to Securing and Retaining Business," C. F. Oehlmann, Cincinnati, Ohio; "Methods of Securing Residential Business," R. W. Hemphill, Ann Arbor, Mich.; "Methods of Securing Sign, Window and Outline Lighting," Homer Honeywell, Lincoln, Neb.; "Methods of Securing Power Business," George N. Tidd, Scranton, Pa.; "Catering to Power for Automobile Charging," R. W. Rollins, Hartford, Ct.; "Establishing Day Circuits in Towns of 10,000 Population and Under," F. H. Plaice, New Bremen, Ohio; "Methods of Exploiting Electric Heating Devices," T. K. Jackson, Mobile, Ala.

POWER.

GEORGE N. TIDD.

As to some of the methods of attaining this desired end, I would suggest:

First—Secure the services of a good operating engineer for the work, a man, if possible, who has been in charge of a central station plant, and one who can appreciate quickly the points involved in good and poor steam engineering. This man should be a good salesman, and with one or more assistants, can cover a good deal of ground by devoting his entire attention to the work.

Second—Canvass of District. Have your power man make a thorough investigation of every power-producing plant in the district, no matter how large or small. Keep a systematic record of every case along lines suggested in plant data sheet herewith shown.

Third—Secure a Large Representative Installation. The first large customer comes hard. After the ice is broken, others have more confidence in your proposition and are easier to handle. It will therefore be of great aid to secure one of these customers to whom you can send and take prospects. The customer should, if possible be one of the leading manufacturers.

Fourth—Trial Demonstration. We frequently meet prospects who are dubious as to the advantages of central station drive in their particular business or conditions. They admit it is good for their neighbor, but for this reason or that, it is not suitable for them. In other words, they are from Missouri and "need to be shown." In these cases, I would install the complete equipment and furnish current to operate for sixty or ninety days' trial.

Fifth—Methods of Selling. Be liberal with your prospects in regard to terms of payment for the motors. In many instances it is advisable to sell upon the instalment plan and allow one or two years to pay for the installation. The small manufacturer especially needs the money in his business and can not afford to make the necessary outlay in cash for the proper installation.

Sixth—Remember every power prospect, especially if it be a large one, must be considered largely as an individual

proposition. You can not make a hard and fast system of rates which will apply to all cases. Do not be afraid to go down on high-load-factor business, simply because your present cost with its low-load-factor is higher than perhaps you will be called upon to quote.

Leon H. Scherck said he had always found that the most difficult thing to do is to increase the rate, and he thought it the worst thing a central station can do; if there is anything central stations should get away from, it is special rates. In an extreme case he would rather make a present of a motor than vary the rate.

J. F. Gilchrist moved a vote of thanks to the publishers of the "Convention Daily." He thought they had rendered an excellent service to the National Electric Light Association this year.

President Williams then took the chair and asked for the report of the committee to draw a resolution of thanks to the people in Washington.

E. H. Davis presented the following report:

"As the enjoyment and social success of the convention has been so largely contributed to by the many enjoyable and interesting entertainments furnished, the National Electric Light Association, on behalf of its members and guests, wishes to express its most hearty appreciation of the courtesies extended and to hereby publicly thank all who have contributed to their pleasure, particularly the President of the United States; the ladies of the District of Columbia; Hon. B. F. Macfarland, president, and the other members of the Board of Commissioners of the District of Columbia; Col. C. A. P. Hatfield, U. S. Army; the Columbia and Chevy Chase Golf Clubs; Mr. G. T. Dunlap and Mr. D. S. Carll, of the Capital City Traction Company; Mr. F. B. Hubbell, and Mr. T. P. Garrett of the Washington, Arlington & Falls Church Railway Company; Gen. George H. Harries, Mr. H. W. Fuller, Mr. E. S. Marlow, and Mr. L. E. Sinclair, and others of our local member company, and generally the members of the Entertainment Committee. The secretary of the association is requested to convey our thanks, as stated in this resolution."

The meeting then adjourned to executive session. At this session certain changes in the constitution and by-laws were made.

The following were also passed at the closing executive session on Friday:

"*Resolved,* That the Committee on Uniform System of Accounting be continued and enlarged as shall seem necessary, and that the committee be authorized to confer with similar committees of other associations, notably the American Street and Interurban Railway Association and the Gas Institute.

"*Resolved,* That if it be considered desirable by the Executive Committee to arrange for an 'Acounting Day' at the next annual convention of this association, and if it seems advisable that accounting subjects shall be presented at a special meeting to be held contemporaneously with the meeting of the main body, the executive committee shall be empowered so to arrange."

The following-named officers were elected for the ensuing year:

President, Dudley Farrand, Newark, N. J.

First vice-president, Alex Dow, Detroit, Mich.

Second vice-president, W. C. L. Eglin, Philadelphia.

Secretary, W. W. Freeman, Brooklyn, N. Y.

Executive Committee: George H. Harries, Washington; A. J. DeCamp, Philadelphia; Samuel Scovil, Cleveland.

The meeting then adjourned.

Convention Notes.

LAST week there was published in the ELECTRICAL REVIEW a very complete report of the exhibits and the manufacturers' representatives in attendance at the thirtieth convention of the National Electric Light Association. At that time, also, it was indicated that the exhibit was one of the most notable which the association has promoted. The scheme of decorations was particularly magnificent, and the uniform character of the booth construction lent a charm to the scene which has never before been approached. Owing to its location on the tenth floor of the New Willard Hotel, and to the care which was exercised in the registration of guests, the gathering was exclusively representative of the central station men and the manufacturers. In point of enthusiasm, also, this exhibition probably outclassed all others. In addition to those manufacturers noted last week, the following were in evidence:

The Keystone Electrical Instrument Company, Philadelphia, Pa., displayed a very attractive line of portable indicating electrical measuring instruments. This exhibit was in conjunction with that of the Jandus Electric Company, Cleveland, Ohio, and was in charge of L. A. Costa and J. T. Manypenny.

The Crouse-Hinds Company, Syracuse, N. Y., displayed a complete line of condulets, and the company's "Imperial" arc light, with cabinets and panel boards.

The Oil Waste and Saving Machine Company, New York city, exhibited its centrifugal oil filters and waste-saving machines for extracting grease, oils, etc., from any substance. The company was represented by W. W. Barker.

The Columbia Incandescent Lamp Company, St. Louis, Mo., made quite an elaborate exhibit at the booth of the National Electrical Supply Company, of Washington, D. C.

Among the various souvenirs distributed at the convention, the artistic card case, with a small memoranda book within, given by J. B. Olson, sales manager of the India Rubber and Gutta Percha Insulating Company, Yonkers, N. Y., was much sought; in fact, on one occasion Mr. Olson was summoned to the hotel drawing room, where he found gathered about fifty ladies, to each of whom he presented this souvenir.

The H. B. Camp Company, New York city, distributed a valuable souvenir in the form of an open-face gun-metal watch.

The General Electric Company, Schenectady, N. Y., distributed scarf-pins in the form of miniature incandescent lamps.

A. H. Patterson, of the Phœnix Glass Company, New York city, was unable to attend the convention, as he intended, due to illness in his family.

Among the old-time attendants whose absence was noted was Cyrus O. Baker, the platinum importer, who was for many years master of transportation for the association.

Edwin R. Weeks, of Kansas City, one of the delegates to the first convention, and a regular attendant for many years, was unable to get to Washington in time for the convention.

The Consolidated Gas, Electric Light and Power Company, of Baltimore, Md., extended a cordial invitation to the members to visit its plants in Baltimore, and the Washington Railway and Electric Company, the Capital Traction Company,

the Chesapeake & Potomac Telephone Company, the Western Union Telegraph Company and the Postal Telegraph-Cable Company extended the courtesies of their lines to the members during the convention.

Quite a number of the members responded to Director S. W. Stratton's invitation to visit the National Bureau of Standards. The director was at considerable pains to furnish guides, who explained to the visitors the various functions of the divisions of the bureau.

The special trains, both from New York and Chicago, carried large delegations to the convention. A feature of the trip on the western special was the decorated menu which was presented to the passengers by the *Western Electrician,* and which had been prepared in electrical style by Frank L. Perry.

This convention was notable for its social side. There were a number of informal dinners, both at the New Willard and at the homes of several members of the local entertainment committee. The reception on Monday evening was well attended, the United States Marine Corps Band furnishing the music. On Wednesday evening there was an informal dinner in the small ballroom of the New Willard, the music being furnished by Haley. This function was well attended and greatly enjoyed.

The automobile rides for the ladies were particularly well arranged, and each day a large number availed themselves of this fine opportunity of visiting the many places of historic and current interest about the capital city.

The reception given by President Roosevelt on Tuesday afternoon was thoroughly enjoyed, nearly 900 members and guests availing themselves of this opportunity of being presented to the nation's chief executive.

On Wednesday afternoon the convention headquarters were deserted for the exhibition cavalry and field artillery drill at Fort Myer. The main party left the New Willard at two o'clock, over the lines of the Capital Traction Company, and after a short journey, arrived in good time to witness one of the most enjoyable features of the entertainment programme. The soldiers were in fine fettle, and were enthusiastically cheered by the onlookers. The irrepressible C. B. Burleigh borrowed one of the cavalryman's caps, and after going along the line, returned it to the soldier boy well laden with silver as an appreciation of the fine showing made.

The trip to Mount Vernon on Thursday was memorable both for the large number of attendants and the weather conditions, which made the boat trip down the picturesque Potomac a constantly recurring series of delights. Ten special cars left the New Willard promptly at one o'clock, and the party enjoyed a buffet luncheon en route. Arriving at the long pier to the south of the mansion, a long climb up the hill, through the orchard, led the visitors to Washington's tomb.

Miss Harriet Billings, the efficient assistant secretary and treasurer of the association, was kept busy receiving congratulations from the delegates. Secretary Eglin announced on the opening day of the convention that Miss Billings was not to do any work, as she had really become the grandmother of the convention. There was such a demand, however, for information which only Miss Billings could give, that she soon demonstrated that she was entirely too active to be placed in the grandmother's list. One of the most popular automobiles en route to the drill at Fort Myer on Wednesday afternoon was that which contained Miss Billings and Miss Carmelita Beckwith, who is very popular among the central station men, and who has contributed greatly to the advertising literature which has helped so wonderfully within the last year or two.

An important feature of the manufacturers' exhibit was a meeting held in the parlors of the Westinghouse company on Thursday afternoon, when a hearty vote of thanks was extended to the National Electric Light Association for the efforts which the officers and various committees had made to create such a successful exhibition. The meeting was opened by W. M. McFarland, vice-president of the Westinghouse Electric and Manufacturing Company. Mr. McFarland said he thought the time was opportune for the manufacturers to perfect an organization for exhibition purposes. Frank H. Gale, advertising manager of the General Electric Company, was chosen chairman of the meeting, and he endorsed Mr. McFarland's expressions. James I. Ayer, who is probably one of the best-known men in the association, sketched briefly the history of the previous association exhibitions. So far he said the exhibit features had been profitable, and he thought that the executive committee would gladly welcome a plan whereby exhibition details would be taken out of its hands and placed under a management separate from the regular association, but cooperating with it at all times. After considerable discussion, the chair was instructed to select a committee of seven to draw up plans for a permanent organization. This committee was appointed as follows: F. H. Gale, chairman; J. C. McQuiston, W. S. Heger, Charles P. Fry, Rodman Gilder, H. M. Post and C. W. Lee.

The following representatives were in attendance at the meeting: James I. Ayer, E. T. Pardee, J. R. Jeffrey, W. S. Heger, J. M. Mills, Francis H. Ely, Benjamin Wall, H. M. Post, Rodman Gilder, W. M. McFarland, J. C. McQuiston, Henry Goodwin, A. A. Serva, Charles P. Fry, F. H. Gale, Glenn Marston, Max Harris, H. B. Logan, T. H. Whaling, F. C. Sutter, James B. Olson.

Several months ago the Co-Operative Electrical Development Association announced that the awards for the prize creed would be made at this convention. It was stated, however, that there was such an unusual number of able creeds written for the competition that the jury of awards was not able to arrive at a decision. The sum of money appropriated for these awards will be placed in the bank, and will draw interest until such time as the awards may be announced. In this way the lucky ones will receive not only the prize money, but whatever interest it may accumulate during the period necessary for a decision to be reached.

West Shore Electric System.

For the purpose of providing sufficient funds for the operation of the West Shore Railroad between Utica, N. Y., and Syracuse, by the third-rail electric system, a meeting of the stockholders of the Oneida Railway Company, which is the name under which the electrified section of the West Shore road will be operated, is to be held in the city of Oneida, N. Y., on June 22. At that time the stockholders will vote on a proposition for increasing the capital stock from $15,000, consisting of 300 shares at the par value of fifty dollars, to $2,000,000 of 40,000 shares at the same par value. The money will be used for the expenses incident to the running of the road when it goes into operation.

Meeting of the Empire State Gas and Electrical Association.

A general meeting of the Empire State Gas and Electrical Association will be held at Lake Champlain, N. Y., on June 27. All the lighting companies of New York state have been invited to attend this meeting. An important feature of the meeting will be a discussion of the Public Utilities Commissions Bill, and the methods employed in fixing the valuation of properties for the purpose of taxation.

International Independent Telephone Association.

THE annual convention of the International Independent Telephone Association was held at the Auditorium Hotel, Chicago, June 4, 5 and 6. The attendance was large and many delegates were present, representing the state associations. The manufacturing interests also were well represented. A brief telegraphic report of the first day's proceedings was given in the ELECTRICAL REVIEW for June 8; a fuller report of the three days' sessions is given below.

Over 800 delegates and visitors were assembled in the banquet room of the Auditorium Hotel when the convention was called to order by President James B. Hoge at 2.30 P. M. on June 4. President Hoge introduced Dr. W. A. Evans, commissioner of health of the city of Chicago, who, in the absence of Mayor F. A. Busse, welcomed the association to Chicago.

The meeting was then addressed by a representative of the Illinois Manufacturers' Association, who took the place of John M. Glenn, secretary of this association, as the latter was unable to attend. He described briefly the efforts of the manufacturers' association to secure a franchise for an independent telephone company in Chicago, which so far have been unsuccessful. It is intended, however, to continue these efforts.

President Hoge introduced H. D. Critchfield, of Milwaukee, who expressed the appreciation of the telephone association of the welcome it had received.

At the close of Mr. Critchfield's address, President Hoge read his annual address.

President Hoge then called for the secretary's report, which was read by John A. Harney, assistant secretary.

The following standing committees were appointed by the president:

Committee on Amendments to the Constitution—Charles E. Sumner, chairman, Oregon; F. H. Woods, Nebraska; Theodore Gary, Missouri; M. B. Overly, Kentucky; Judge Smith, New York.

Committee on Credentials — A. C. Lindemuth, chairman, Indiana; Alpheus Hoover, Canada; G. S. Shanklin, Kentucky; W. H. Nelson, Kansas; W. H. Bassett, Illinois; T. H. Ferris, New York; G. W. Thompson, Ohio; E. H. Pollock, Nebraska; F. D. Houck, Pennsylvania; J. B. Ware, Michigan; J. W. Barnes, West Virginia; E. H. Moulton, Minnesota; W. T. Wynne, North Carolina; F. H. Stowe, California; Houck McHenry, Missouri.

Committee on Resolutions—James S. Brailey, Jr., chairman, Ohio; C. W. Kline, Pennsylvania; S. S. Lichty, Iowa; W. J. Uhl, Indiana; W. B. Woodbury, Michigan; Manford Savage, Illinois; H. D. Critchfield, Wisconsin.

Nominating Committee—D. E. Sapp, chairman, Ohio; O. C. Snider, Missouri; Charles West, Pennsylvania; Richard Valentine, Wisconsin; H. S. Baker, Iowa; E. L. Barber, Kentucky; M. L. Clawson, Indiana.

Auditing Committee—Charles West, chairman, Pennsylvania; C. C. Deering, Iowa; C. S. Norton, Indiana.

The president announced that Charles S. Norton, of Indianapolis, would have charge of the question box and that he would be assisted by C. B. Cheadle, of Joliet, Ill., and A. E. Bouqua, of Arkansas.

The auditing committee, through its chairman, Charles W. West, of Pennsylvania, reported that the total receipts from June 26, 1906, up to and including May 25, 1907, amounted to $17,444.11. There was a cash balance on hand June 16 of $1,113.73, making a total of $18,557.84. The total disbursements amounted to $18,241.60, leaving a balance in the treasury of $316.24. The total assets of the association amount to $4,254.39, and the total liabilities to $5,845.51, leaving a deficit of $1,691.12, which has since been provided for.

Senator C. W. Kline, of Hazelton, Pennsylvania, moved that a committee to consider the incorporation of the International Independent Telephone Association be appointed. The motion was carried and President Hoge named on this committee: Frank L. Beam, Ohio; R. E. Matteson, Nebraska; W. S. Vivian, Michigan; A. C. Davis, West Virginia; Alpheus Hoover, Canada.

The feature of the programme, "Short Talks on Practical Subjects," was taken up and President Hoge called for brief remarks on "Construction Problems." C. E. Tarte, of Grand Rapids, said: "Most of us have been more or less scared at the high cost of material, and many have ceased work at an inopportune time on this account to wait for prices to go down. I think this is not altogether wise, especially as regards the construction of toll lines. It is better in my opinion to buy copper for toll lines and go ahead now, as we can make good profit even at existing prices of material." Mr. Tarte emphasized the advisability of proceeding with the building of toll lines so that competitors do not get ahead of the independent companies and secure the long-distance business.

Charles E. Sumner, of Portland, Ore., said: "Construction work in the Northwest is proceeding rapidly and indicates a healthy condition of business in our territory."

The subject of "Shield Advertising" was called, but not discussed.

C. W. West, of Pennsylvania, informed the convention that a bill has been introduced in the Pennsylvania legislature making it a felony to use any design similar to the American flag for advertising purposes. "We have made wide use of the shield in Pennsylvania," said Mr. West, "and it would be a serious thing if we were compelled to stop. That matter should be taken up at this convention." Senator Kline explained that the Pennsylvania legislature intended only to prevent any desecration of the flag and appeared to consider the matter one to cause no alarm.

"Collection Methods" was the last subject discussed at the first session. J. B. Rhodes gave his views as favoring the guarantee of good service to be followed by vigilant methods in making patrons pay promptly.

At 4.30 the convention adjourned until Wednesday morning at 10 o'clock.

WEDNESDAY MORNING SESSION.

President Hoge called the convention to order at 10.30 o'clock Wednesday morning. The topic, "The Long-Distance Business," was taken up, the first feature of the discussion being a paper by C. E. Tarte, of Grand Rapids, Mich., on "Independent Improvements and Possibilities." Mr. Tarte's paper was listened to with much interest. In conclusion he said that the traffic association established in Michigan had worked very satisfactorily. Before its formation the independent companies found it difficult to furnish long-distance service, as, for instance, his own company at Grand Rapids was unable to handle or control the toll business properly after it had left the lines of that company. Now every company felt assured that it would receive its just share of the haul and all concerned worked in harmony to make the service a success. He urged every state to form such a clearing association and offered to render any assistance within his power to help along that line.

A. L. Tetu, of Indianapolis, who is going to Portland, Ore., to become manager of the Howe company of that city,

was called upon and in an earnest address urged independents to stand together.

Senator C. W. Kline, of Pennsylvania, took up the discussion of long-distance lines and said that the sooner the independents realize that the long distance must be divorced from local matters the better. How to accomplish this must be seriously considered. He favored all the interests of a state forming an overlying long-distance company to take care of that kind of business. He urged the necessity of giving the public good service and convincing the people that the independents can give as good service as the Bell. Senator Kline pointed out the unsatisfactory features of long-distance communication under the varying conditions of different companies and said that in his experience he found that no matter how well his own company performed its work it was blamed for the shortcomings of other companies which had a part in the transmission of the messages. Each company had to be responsible for the weakest spot in the chain.

Following Senator Kline, Mr. Hulett said: "It seems to be the consensus of opinion to have long-distance telephones. The question seems to be, how to get them? It takes money. The united action of the independent telephone men will ultimately bring about a long-distance telephone system. A careful study of the situation for the past four years leads me to believe that there is now an opening. I believe we must enter into the telegraph business. Some three years ago there was a movement started in Chicago to do that. Circumstances were against it at that time. There is no reason in my mind why the telephone and telegraph business can not be consolidated. I believe that a movement emanating from the independent telephone people will bring to your support capital and customers for the independent telegraph-telephone people. To the leased-wire people who are using from half a mile upward of leased wire I say make their fight your fight and your fight their fight. With these people you can build your telephone lines and you can operate them. One firm here pays $750 for leased wires and it is too small for the Western Union to take into consideration. Why can not you arrange to do that business?"

Mr. Gladden, of the Committee on Resolutions, presented a resolution which expressed the appreciation of the association for the invaluable services rendered by President James B. Hoge during the three years he has served as president. This was adopted by a rising vote.

A resolution was also adopted condemning vigorously any connection with Bell companies, which, it was reported, was being sought. Another resolution, also adopted, declared that the association would recognize any independent company on the ground and giving satisfactory service and would repudiate any other company which attempted to enter its territory.

The roll of states was called and a number of reports showing satisfactory conditions were made.

C. S. Norton, secretary of the Indiana association, then read a paper entitled "The Indiana Situation."

James S. Brailey, Jr., of the United States Telephone Company, Toledo, Ohio, delivered his paper on "The Strength of the Chain."

The report of the Committee on Forms of Accounting was presented by Charles West, of Pennsylvania, and upon motion, was accepted.

W. J. Stadelman, of Sioux City, Iowa, read a paper on "Long-Distance Advertising."

Frank Hart, of Pittsburg, Pa., contributed a paper on "How to Handle Long-Distance Business."

J. B. Earle, of Waco, Tex., read a paper on "Telephone Legislation in Texas."

THE ANNUAL BANQUET.

Wednesday evening the annual banquet of the association was held in the banquet hall of the Auditorium. Nearly 400 were seated at the tables. Senator Kline, of Pennsylvania, acted as toastmaster of the evening. Luke Lee, of Nashville, Tenn., responded to the toast "The New South." T. Harvey Ferris, of Utica, N. Y., spoke on the subject, "The Empire State," and Helm Bruce, of Louisville, Ky., discussed "The Telephone in Modern Life." Toastmaster Kline called upon several other speakers to make remarks.

THURSDAY SESSION.

Thursday morning the convention reassembled at ten o'clock, and J. M. Plaister, of Ft. Dodge, Iowa, read a paper on "The Toll-Line Clearing House."

J. S. Haley, of Livingston, Mont., read a paper on "Where the Copper Comes From."

At this time the question box was opened. The inquiries contained therein led to interesting discussions. The first question was: "What is the best illustration to impress upon the public the cost of operating an exchange increasing with the number of its subscribers?" This was discussed by Messrs. Polk, Thayer, Thompson, Fisher and Tarte.

At this point W. B. Woodbury, of Detroit, chairman of the finance committee, requested that he be allowed to read the report of the committee appointed to raise funds to meet the deficiency: "At the meeting of the executive committee held at Indianapolis, May 15, President Hoge reported that there would be on June 1 a deficit of $5,800, and that he had exhausted every means in his power to provide this amount. After some discussion, it was resolved to confer with the manufacturers and publishers with a view of financing this debt. To this end a committee was formed consisting of E. L. Barber, C. Y. McVey, W. D. Woodbury, H. B. McMeal, W. H. McDonough, J. G. Ihmsen and Walter E. Doolittle. This committee started at once upon the raising of the amount necessary, and solicited subscriptions from operators, publishers, manufacturers and supply dealers. The net result of its work is that it has handed to J. G. Splane, treasurer of the International Independent Telephone Association, the sum of $6,705, which is $905 over and above the amount of the deficit. It has also handed to him a list of pledges amounting to $1,775."

A paper on "Independent Telephone Securities as an Investment" was read by William L. Moellering, of Ft. Wayne, Ind.

Charles E. Sumner, of Portland, Ore., discussed briefly "Post-Office Telephones and the Washington Situation." At the next session of Congress a bill will be introduced granting an independent telephone franchise at the national capital. At present the Bell has a monopoly at Washington, and at one time the Post-Office Department issued an order which practically recognized and made effective that monopoly. Since then that order has been rescinded, and there is now no reason why there should not be an independent system operating in the District of Columbia. Mr. Sumner urged the members of the association to secure the support of their representatives in Congress for an independent franchise.

Senator Kline reported from the committee on resolutions a resolution covering the Providence (R. I.) situation. The resolution pledged the independent telephone men who are trying to gain an entrance into Providence warm support and seconding their efforts in every way. A copy of the resolution proving that the International Independent Telephone Association is back of the Providence men, will be sent to the mayor and city council of that city. The resolution was adopted, as was also the usual resolution of thanks to the manufacturers, supply houses,

Chicago committee and every one else who assisted in entertaining the convention.

Dwight E. Sapp, of Mt. Vernon, Ohio, as the chairman of the nominating committee, read the following list of nominations:

President—Theodore Gary, of Missouri.

First vice-president—Frank L. Beam, of Ohio.

Second vice-president — Charles E. Sumner, of Oregon.

Third vice-president—E. B. Fisher, of Michigan.

Fourth vice-president—Alpheus Hoover, of Canada.

Secretary—Charles West, of Pennsylvania.

Treasurer—Manford Savage, of Illinois.

As the present constitution and by-laws made provision for only two vice-presidents, Frank H. Woods, of Nebraska, moved that the convention vote at first on the election of president, first and second vice-presidents, secretary and treasurer. The motion was carried, and on a subsequent motion made by Mr. Sapp the above-named nominees for the respective offices were unanimously elected.

President Gary was conducted to the chair and delivered a brief address in which he expressed his appreciation of the honor conferred upon him and his determination to spare no efforts to advance the welfare of the association.

Secretary West was conducted to the secretary's desk and in a few well-chosen words thanked the convention for the honor conferred upon him and promised to use every effort to advance the interest of the association.

Manford Savage, the new treasurer, was given the floor and addressed the convention.

Charles E. Sumner, the chairman of the committee on constitution and by-laws,

MR. THEODORE GARY, PRESIDENT INTERNATIONAL INDEPENDENT TELEPHONE ASSOCIATION.

was recognized and read eight amendments which make important changes in the association's constitution, all of which were adopted.

These make changes in the number of officers; in the standing committees; in the method of fixing the time and place of the conventions; the executive committee is empowered to create sectional memberships for manufacturers, supply dealers, engineers and publishers; the additional sections suggested in the president's address are provided for; the treasurer is authorized to pay bills approved by the president and secretary, without obtaining approval of the executive committee; certain changes are made in the duties of the advisory board, and in those of the executive committee.

Former President Hoge submitted several other amendments which were also adopted. One of them was to drop the words "of America" from the title of the association, as he said the name was too long and unwieldy. Mr. Hoge also moved to amend the by-laws so as to continue the finance committee, and the president was authorized to name a finance committee within thirty days. There will be seven members. It was also agreed that states having less than 10,000 units shall not be debarred from representation in the association.

At 1.30, there being no further business, the convention adjourned.

The Exhibit of the Telephone Manufacturers.

The Rock Island Battery Company, of Cincinnati, Ohio, had on exhibition the celebrated Rock Island dry batteries. Myer A. Loeb, general manager, and Charles Wilson, sales department, were in attendance. As a souvenir, the delegates were presented with an attractive paper cutter.

Durant Electric Supplies Company, Chicago, Ill., had on exhibition the celebrated ironite duplex drop wire and a number of other electrical and telephone specialties. This company's exhibit attracted a great deal of attention. H. S. Durant, president; F. W. Pardee, treasurer; J. F. Crook, vice-president, were in charge of the exhibit.

Miller Anchor Company, Norwalk, Ohio, had on exhibition a full line of its anchors. The company was represented by G. H. Miller, president, and F. B. Miller, vice-president.

F. B. Cook, Incorporated, Chicago, Ill., exhibited a new porcelain terminal for outside work. This is a new device just put on the market by this company; also full line of standard terminals, protective devices and accessories. Those in attendance at the exhibit were F. B. Cook, H. R. Cook, F. A. Rader, E. E. Dewey, S. C. Harvey, J. M. Moore, John F. Tompkins, C. C. Newburn and F. R. Parker.

L. M. Ericsson Telephone Manufacturing Company, Buffalo, N. Y., represented by J. H. Montague, sales manager; Joseph R. Power and H. B. Hewitt. This company exhibited switchboards, telephones, parts and novelties.

Vote-Berger Company, La Crosse, Wis., exhibited a full line of switchboards, telephones and D. & T. anchors. They exhibited a 3,200-line ballast central energy switchboard. The company was represented by M. I. Berger, secretary and treasurer; C. D. Enochs, chief engineer, and J. F. Pfeiffer. A miniature D. & T. anchor in the form of a scarf-pin was given away by this company as a souvenir.

W. N. Matthews & Brother, St. Louis, Mo., exhibited the well-known Stombaugh guy anchor, also the Hargis cable-splicing joint and the Callahan cable roller. Claude Mathews and O. R. Johann were in charge of the exhibit.

Wire and Telephone Company of America, Rome, N. Y., exhibited a line of Easophones and rubber-covered telephone wires. Represented by Frank M. Potter, Jr., vice-president; H. A. Hammond, manager of sales, and A. J. Kennedy.

Long-Distance Telephone Manufacturing Company, South Bend, Ind., had on exhibition telephone apparatus for heavy work, battery, wall instruments and desk sets. J. W. Culp and R. E. Willard were in charge of the exhibit.

Chance Manufacturing Company, Centralia, Mo., exhibited the skyrocket lightning arrester. Exhibit in charge of A. B. Chance, secretary and treasurer.

American Clock Company, Chicago, Ill., exhibited its new telephone time stand which prints in quarter minutes; exhibition in charge of P. J. Hertz.

Automatic Electric Company, Chicago. Ill., exhibited a 100-line unit of column battery automatic switchboard with twelve

(Continued on page 998.)

POWER DEVELOPMENT ON THE KOOTENAY RIVER FOR THE WEST KOOTENAY POWER AND LIGHT COMPANY, LIMITED.[1]

BY ROBERT A. ROSS AND HENRY HOLGATE.

The Kootenay river rises in the northern part of Windermere, in British Columbia, a short distance east of the head waters of the Columbia river, and flows southerly parallel to the north-flowing waters of the Columbia for fifty miles, thence through Fort Steele and across the International Boundary into United States territory, flowing south and northwest for a distance of about 120 miles.

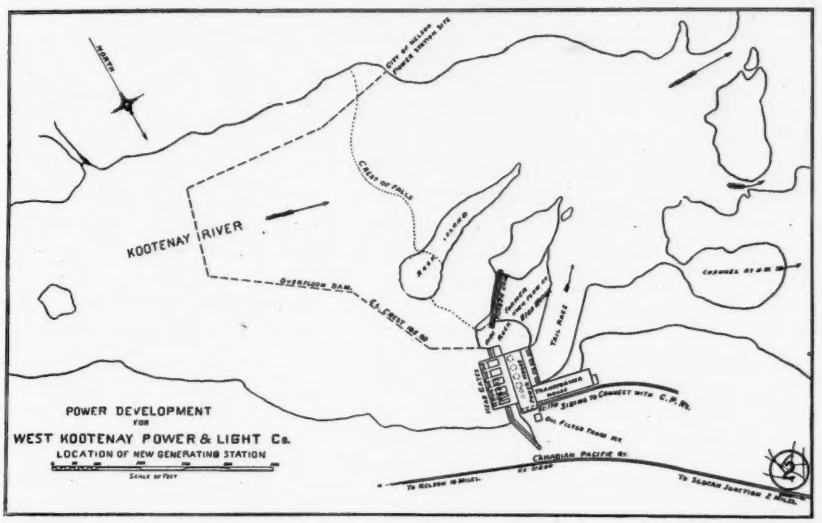


FIG. 1.—THE SITE OF THE POWER DEVELOPMENT OF THE WEST KOOTENAY POWER AND LIGHT COMPANY.

It then enters Canadian territory again, and soon expands into what is known as Kootenay Lake, which receives a number of small streams in its northern arm. The lake discharges by way of the west arm, at the western end of which is the town of Nelson; the river keeps a southwesterly course to its junction with the Columbia river at Robson. The total length of the river is about 350 miles, and the area drained by it and its tributaries, above a point ten miles below Nelson, is some 9,800 square miles, of which 2,500 square miles are United States territory.

The minimum flow of the river, at a point about nine miles below Nelson, was found to be 5,850 cubic feet per second. These measurements were taken in January, 1905, when the water in the river was lower than at any season previously observed. The variations in flow of the river are very great, but no measurement of maximum flow has been made as far as is known. The periods of high and low water differ from those of rivers not situated in mountainous country, and, in the case of the Kootenay river, which largely depends for its supply from the masses of melting snow on mountains of great altitude, the high water period is comparatively late in the season, highest water being in June and July.

The power development herein described was built at the Upper Bonnington Falls, the lower falls having been partially developed some years ago by the same company. The site for the development of the upper falls was chosen on the north bank of the river, and is generally shown on accompanying diagram Fig. 1.

The channel between the Rocky Island and the north bank was made use of for approach and tail-race; the power-house was built in the river, and a cofferdam was built from the bank to the island, thus unwatering the whole site and diverting the water to the south of the island. Although the natural channel assisted materially in the development work, yet about 40,000 cubic yards of rock had to be removed to provide power-house foundations and tail-race. The removal of this rock was somewhat difficult, owing to the confined area in which the work had to be done, the difficulty of disposing of it, the nature of the rock (Nelson granite) and the irregularity in direction of the seams in the rock, some of which had to be excavated under water. As a large part of the concrete work admitted of the use of large stones, those most suitable for the work were piled up in convenient places for this purpose, and a large quantity was passed through crushers and used in the concrete.

The variations between high and low water above and below the falls do not correspond. The reason for this is, that at present the flow of the river below the falls is restricted by a number of rocky islands. These hold back the flow of the stream, but it is the intention to improve this channel, so as to afford more channel area and more nearly equalize the rise and fall below the falls with the rise and fall above them.

Owing to these variations, which can never be entirely eliminated (except at a cost beyond commercial practicability), the vertical type of wheel setting was adopted, using all the head available at all stages of water, instead of adopting a head which would be nearly constant and which would involve the sacrifice of a large amount of power for periods when low water prevailed. Of course, when the natural head is least, the volume of water used is not important, as the quantity available is more than ample, but at periods of low water the head is greatest, and the vertical setting is an advantage, since it permits the use of the higher head. Had a horizontal wheel setting been adopted, the power-house floor would have had to be set above highest water, and, allowing the use of a draft tube of twenty-four feet at this altitude, the tail-water would have had to be maintained at a level above low water, which would involve the loss of head for a considerable period of every year when water was low and, consequently, when head was most valuable.

It is the intention to increase the natural head by building a timber dam across the river to a height that will drown the rapids above the fall, thus affording an increase of head of ten feet, and the machinery and works are designed to meet this condition. This work will be done during the current year. There are no troubles from ice on this river.

It is possible to construct works at the outlet of Kootenay Lake to maintain the lake level more nearly uniform, and thus to assist materially in reducing maximum discharge and increasing minimum discharge of the river below this point. This will render working conditions much better and increase the potentiality of the river considerably. However, the matter has not yet been considered by the government, though it would afford advantages of public benefit in the navigation of the lake, which is now, and will perhaps always be, a part of the transportation system of this district, owing to the great

[1] Read at joint meeting of the mechanical and electrical sections of the Canadian Society of Civil Engineers, May 9, 1907.

difficulty of constructing a railway from Kootenay Landing to Proctor, located seventeen miles above Nelson.

The power-house construction and arrangement are shown on the accompanying sketches, Figs. 2 and 3, and the photographs, Fig. 4 and 5. The building is entirely of monolithic concrete construction, reinforced wherever necessary; the reinforcement consisting of round steel rods, and in some places of steel rails, which were used in parts of the structure under severe strain.

The general scheme can readily be seen by referring to Fig. 2. The water enters the flume through the submerged openings between the piers, and can be shut off by gates or by stop logs, the latter being provided for, so as to render the gates accessible in case of emergency. Behind the gates are the screens, which are thus rendered accessible for repairs or cleaning if necessary. The water flows down the tube formed in the concrete to the wheels, of which there are three on each shaft, two discharging into the upper draft tube and one into the lower tube, uniting in a common discharge, which is placed below low water. The draft tubes are molded in concrete and have no steel lining, being built up with the structure, cored openings in the monolith. Care was taken to secure a very smooth surface on the inside of all passages for water, and their curves and cross sections were designed to offer as little resistance as practicable.

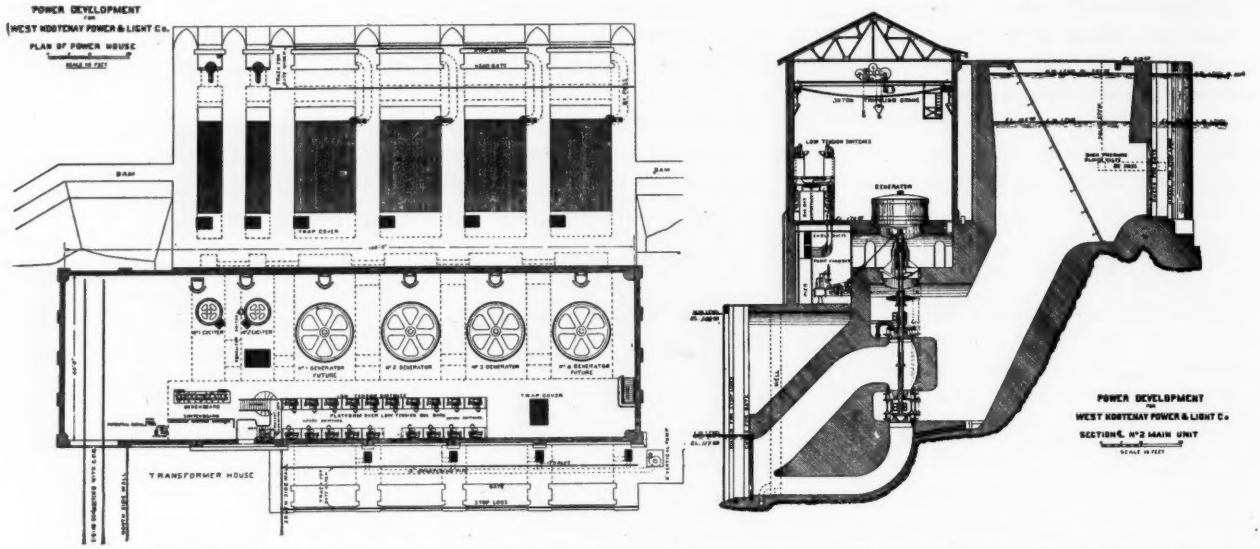

POWER DEVELOPMENT
WEST KOOTENAY POWER & LIGHT Co.
PLAN OF POWER HOUSE
TRANSFORMER HOUSE
POWER DEVELOPMENT
WEST KOOTENAY POWER & LIGHT Co.
SECTION & N° 2 MAIN UNIT

FIG. 2.—WEST KOOTENAY POWER AND LIGHT COMPANY. PLAN OF POWER-HOUSE AND SECTION THROUGH NO. 2 MAIN UNIT.

tension cables are all located in the chamber below the power-house floor, Fig. 6, the only machinery on the floor being the generators, controlling board and the low-tension switches. The crane travels the length of the power-house and over the railway track, so that all machinery can be handled from the car to place by the crane. Any leakage through the up-stream wall is taken care of in the air space and drained off.

The tail-race openings are also provided with gates and stop logs, which can be closed, and any chamber can be emptied of its water by a system of drains and

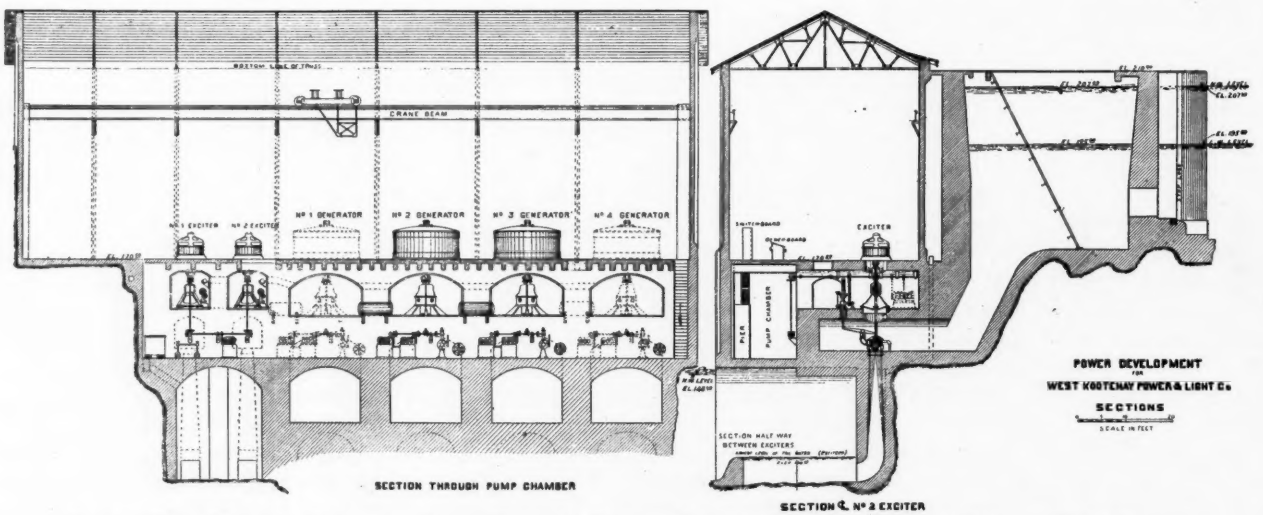


FIG. 3.—WEST KOOTENAY POWER AND LIGHT COMPANY. SECTION THROUGH PUMP CHAMBER AND THROUGH NO. 2 EXCITER.

The exciter turbines are similarly arranged, but are made to operate under a constant head by having the discharge at a higher level, which level is maintained by a weir, Fig. 3.

The pressure pumps, governors, and low valves, leading the water from any one chamber to a well at the south end of the building, where a centrifugal pump throws it out into the tail-race. The head water is admitted through a by-pass as shown on plan Fig. 2. The whole

scheme provides the greatest facility for inspection and making of repairs when necessity arises.

The transformer house and switch room are clearly shown in plan and section in Figs. 7 and 8, and Fig. 9 gives a view of the exterior. The floor of the transformer room is at such a level as to permit of the transformers being wheeled on their own trucks from a flat-car on the railway siding into place. The transformers are entirely separated from the switch room by a concrete wall, and the whole building is of concrete, including the partitions and barriers.

Owing to the peculiar location necessary for the transformer and switch building in relation to the power-house, it was necessary to throw arches over a gap in the rock to provide foundations for the building.

As this work is the largest single piece of concrete construction yet built in the province, it is satisfactory to be able to say that the whole of the cement used was

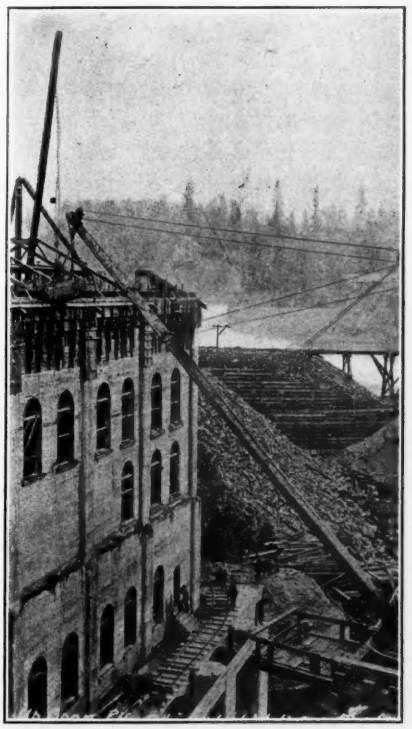


FIG. 4.—WEST KOOTENAY POWER AND LIGHT COMPANY. VIEW OF POWER-HOUSE UNDER CONSTRUCTION.

manufactured in British Columbia, and successfully passed the rigid tests of the engineers prior to acceptance.

Hydraulic Machinery—Each main unit is capable of delivering to its electrical generator 8,000 mechanical horse-power when operating under a head of seventy feet of water and when running at a speed of 180 revolutions per minute. The quantity of water required by a unit is 1,260 cubic feet per second, or a volume equal to the flow of a river 100 feet wide, five feet deep, and moving with a velocity of 151.2 feet per minute.

Each 8,000 horse-power turbine consists of three inward-flow Francis runners mounted on a vertical shaft, each runner being equipped with its own distributor and movable guide vanes. The distributors are bolted to heavy cast-iron base rings secured to the masonry. The runners are thus mounted in concrete pits, which form the turbine wheel casings and the draft tubes for carrying the discharge water to the tail-race.

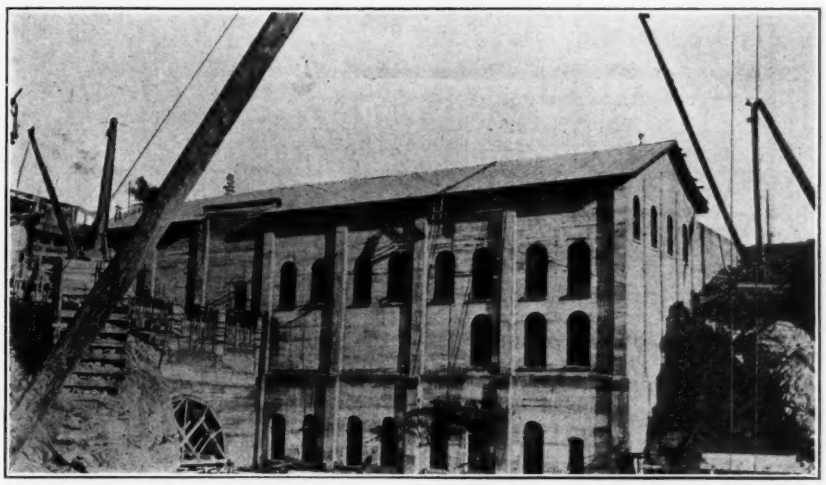


FIG. 5.—WEST KOOTENAY POWER AND LIGHT COMPANY. DOWN-STREAM VIEW OF POWER-HOUSE.

The runners are made of special turbine metal of approximately eighty-eight parts copper, ten parts tin, and two parts zinc. Each is made in one piece, cast in cores and bolted to the hub. The hubs are made by enlarging the shaft at the points where the runners are attached, and heavy flanges are turned on the shaft above the hubs, to which the runners are securely bolted.

The upper and intermediate runners discharge in opposite directions into a common-draft tube, the upper one discharging downward. The lower runner, like the upper one, discharges downward also, but into its own individual draft tube. The chamber above the upper runner is bypassed to the draft tube, which relieves the pressure in the chamber, and thus eliminates the hydraulic thrust of this runner. As the other two runners discharge in opposite directions, the total resultant thrust on the shaft is theoretically zero. The thrust bearing, however, has been designed to take care of a generous amount of thrust over and above the dead weight of the revolving parts. The revolving parts consist of the rotor of the generator, the shaft in three sections, three runners weighing 4,000 pounds each, couplings and bolts, making a total of 170,000 pounds. The thrust bearing consists of two specially close-grained cast-iron discs. The lower disc is supported by a ball seat, while the upper is securely held in place by an adjusting nut on shaft. The discs have raised lips on the outside and inside circumferences, so as to form an annular

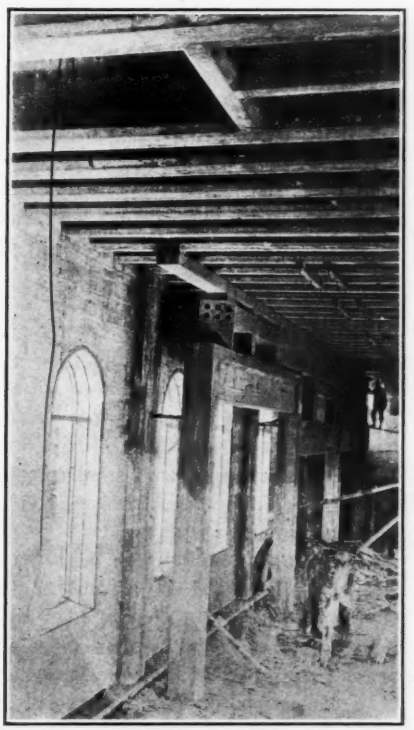


FIG. 6.—WEST KOOTENAY POWER AND LIGHT COMPANY. PUMP CHAMBER AND DUCT SYSTEM.

pressure chamber, into which the oil is forced under a pressure of 250 pounds, which lifts the revolving parts. When these parts are lifted the oil escapes between the surfaces of the discs, by this

means supporting the total weight on a film of oil.

The thrust bearing is covered with a cover, fitted with glass peep holes. The oil is supplied to the bearing from a high pressure triplex pump, capable of working under a pressure of 500 pounds per square inch. This pump is directly driven from the main turbine shaft by bevel gearing and countershaft. Each turbine has its own pump, oil tank, piping, gauges, etc., which, in fact, is a complete system in itself, and independent of the governor system.

An extra motor-driven pump, with piping, has been provided, which is arranged to act as a spare for any one of the main units or exciters, but its primary use is to supply oil to the turbine when starting up.

The main turbine shaft is kept in alignment by three guide bearings. The upper guide bearing is built in conjunction with the thrust bearing. It is lined with Parson's White Brass and is lubricated by oil supplied under pressure.

The intermediate and lower guide bearings, the former situated above the upper runner, and the latter between the intermediate and lower runners, are of lignum vitæ, made by driving lignum vitæ into the dovetail spaces in the bronze boxes. As these bearings are submerged, they are well lubricated with water and require little or no attention.

The water is distributed to the runners through malleable iron movable guide vanes finished smooth, so as to offer little resistance to the water. These vanes are operated by means of links from one side of the vane. The links are connected up to the vane operating ring. The rings are operated by rods and levers from a vertical shaft which leads to the operating deck, where the governor is located.

The revolving balls of the governor control a pilot valve attached to an equalizing lever. This valve operates a relay valve, which in turn controls the main operating piston, which is connected to the vane operating shaft.

An oil pump, a pressure tank, and the necessary piping is furnished with each governor.

In order to control the speed of the turbines from the switchboard, each governor is furnished with remote electric control.

The two upper sections of the main turbine shafting are joined together by a cast-steel coupling four feet in diameter. The brake mechanism is fitted about the coupling, the outer edges forming the brake band. Two brake-shoes are applied on the brake band, and a hand mechanism is arranged so that a force of 10,000 pounds is brought on each brake-shoe.

Each turbine is guaranteed to give an efficiency of at least eighty per cent when delivering 8,000 horse-power and operating under a head of seventy feet running at a speed of 180 revolutions per minute.

The hydraulic machinery is all the product of the I. P. Morris Company, whose hydraulic engineer, W. M. White, designed and carried out the work so successfully.

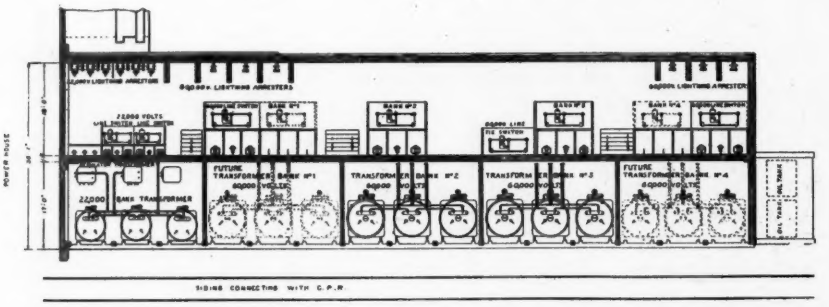


FIG. 7.—WEST KOOTENAY POWER AND LIGHT COMPANY. PLAN OF TRANSFORMER HOUSE.

ELECTRICAL DEVELOPMENT.

The general scheme of electrical distribution is so arranged that power can at present be delivered to Phœnix, seventy-nine miles distant, at 60,000 volts; Grand Forks, sixty-nine miles distant, at 60,000 volts; Greenwood, eighty-three miles distant, at 60,000 volts, and to Rossland, thirty-two miles distant (in the latter case over the existing lines of the old plant), at 22,000 volts.

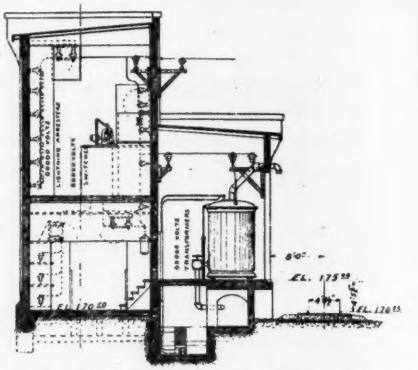


FIG. 8.—WEST KOOTENAY POWER AND LIGHT COMPANY. SECTION THROUGH SWITCH ROOM.

It will be seen that owing to the complication involved in tying-in to the old plant two transmission voltages were required, and therefore transformers, switching apparatus, etc., had to be provided for both.

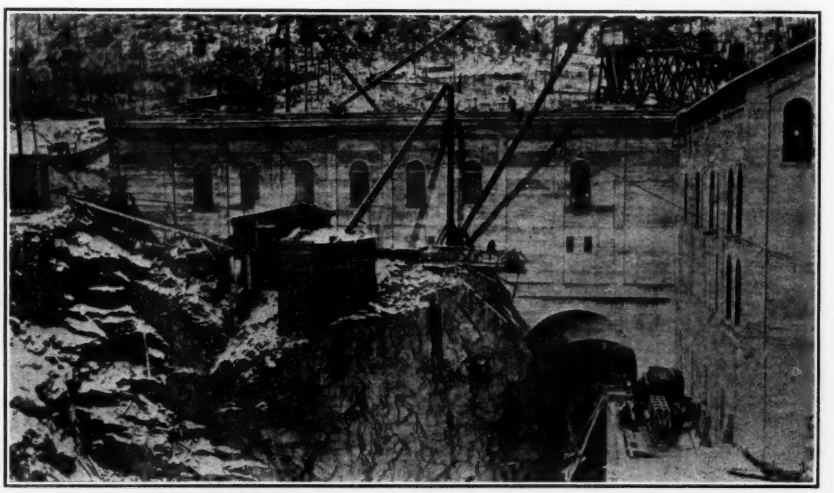


FIG. 9.—WEST KOOTENAY POWER AND LIGHT COMPANY. EXTERIOR VIEW OF TRANSFORMER HOUSE AND SWITCH ROOM UNDER CONSTRUCTION.

The whole of the power so far sold is used for mining work for large motor equipments, for the lighting and power of the mines, and the lighting requirements of the various mining towns above mentioned.

In addition, it is thought that the company will be able, at some time in the

not distant future, to sell power to the railways in the vicinity of Rossland for operating, especially on the heavy grades necessary in attaining the elevation of the Rossland camp. The haulage over those grades at the present time is operated by steam locomotives of special type. In some cases these are geared, and switchbacks are established along the route in order to ease grades and for safety. As the heaviest grade does not exceed four and one-half per cent, this is quite within the capacity of a modern electric locomotive of considerably less total weight than the present steam machines, and as the advent of the single-phase motor has rendered it possible to operate without the use of rotary converters or dynamo motor sets, the problem is much simplified.

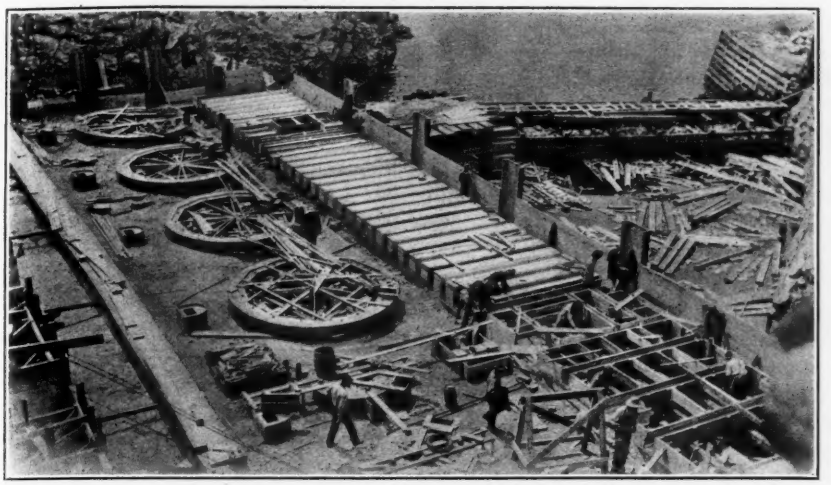


FIG. 10.—WEST KOOTENAY POWER AND LIGHT COMPANY. GENERATOR ROOM FLOOR UNDER CONSTRUCTION.

Generators and Exciters—The generators are four in number, each of 4,500-kilowatt capacity at 2,200 volts and eighty per cent power-factor, at a frequency of sixty cycles, being of the umbrella type and directly connected to vertical water-wheels. Two units only are at present installed. Fig. 10 shows the generator floor during construction.

The exciters are two in number, each of a capacity sufficient to excite the entire equipment when finally installed. These are also of the umbrella type and directly connected to vertical wheels.

Generating Station Switchboard—Current is carried at 2,200 volts to the bus-bars, in compartments elevated above the station floor, and formed entirely of concrete, all parts being thoroughly barriered with the same material. The top of this bus-bar compartment, in which all operating transformers are placed, forms the base of a platform, upon which are mounted nineteen 2,200-volt oil switches, all being motor-operated by distant control from the bench-board.

The bench-board, which contains the controls for the whole of the station, including the 2,200-volt switches, 20,000-volt switches, 60,000-volt switches, together with the speeders for the water-wheels, is situated in front of the instrument panel at the end of the station, all connections thereto being reduced to a pressure of not over 110 volts for safety.

The general switching arrangement has been worked out on the basis of two separate and distinct plants, which may be coupled together or run separately on any transmission line or any bank of transformers.

The cables for connecting to the low voltage bus-bars, and from thence to the transformer station adjacent, are all rubber covered and drawn into bituminous fibre ducts, which are embedded in the concrete floors, partitions, etc.

Transformer Station—The transformer station is arranged for four banks of 60,000-volt transformers, each transformer being of 1,875 kilowatts capacity, at 60,000 volts, and one bank of three transformers, each of 1,000-kilowatt capacity, at 20,000 volts, for interconnecting between the station herein described and the old development, which is distant about one mile; of these two banks of 60,000-volt and one bank of 20,000-volt transformers have been installed.

All of the switches throughout the transformer house are motor-operated and

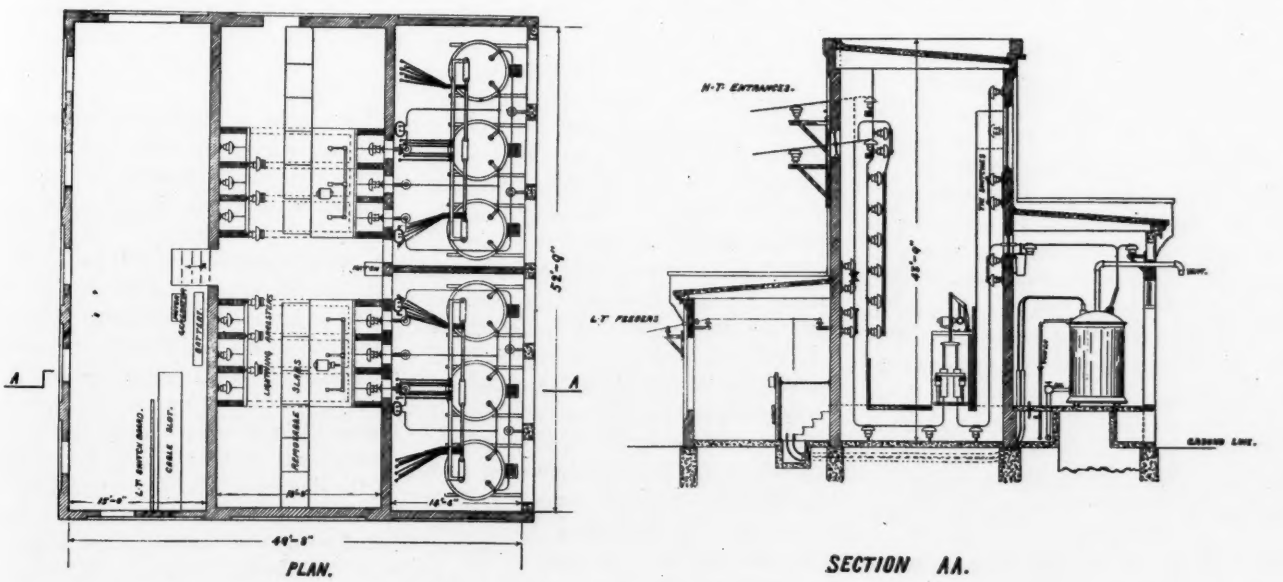


FIG. 11.—WEST KOOTENAY POWER AND LIGHT COMPANY. PLAN AND SECTION OF TYPICAL SUBSTATION.

controlled from the bench-board in the same station.

In every case live parts, such as wires, etc., are kept three feet apart and eighteen inches from all walls and barriers, and mounted on 60,000-volt insulators. The transformers are oil-filled and water-cooled, and have all the necessary connections for natural circulation of water and for handling of oil into and out of storage tanks by means of oil pumps.

SUBSTATIONS: PHOENIX, GRAND FORKS, GREENWOOD.

The design of these substations, all of which are alike, is shown in Fig. 11.

Both the transmission lines enter the tower through special entrances, consisting of plate glass and porcelain tubes; from whence the lines pass through the choke-coils and disconnecting switches, and from there into the high-tension distant-control oil switches, and finally into the main transformers, being transformed in pressure from 50,000 to 2,200 or 440 volts, as required by the motor service.

The transformers of 1,000 kilowatts each are located in banks of three in separate compartments, the necessary cooling water and oil piping and tanks being supplied. The transformers are mounted on trucks and arranged so that they can readily be run out of the compartments.

High-Tension Switch Room and Tower —In this compartment are installed all the high-tension apparatus, lightning arresters, switches, etc. The floor of this compartment is raised four feet above the general level, the space thus rendered available being used for carrying the high-tension lines connecting between lines and switches. For convenience in inspecting and cleaning the lightning arresters, etc., an elevated walk-way has been provided in this compartment. All low-tension cables are carried in fibre conduit set in concrete.

Low-Tension Switchboard Room—This room contains all the control apparatus for the high-tension switches, etc., as well as feeder panels for low-tension lines, also the storage battery for operating the motor-operated switches, motor generator set for charging the batteries, etc. One end of this compartment is reserved as a storeroom for supplies.

The construction of this entire plant was done by day labor under the supervision of the engineers. It was commenced in June, 1905, and water was admitted to the forebay December 24, 1906. Exciters were operated on December 29, and one of the power units went into commission on the following day.

NEW DEVELOPMENTS IN ARC LAMPS AND HIGH-EFFICIENCY ELECTRODES.[1]

BY GEORGE M. LITTLE.

Arcs for lighting may be formed between electrodes of many different kinds. This paper deals with the development of the so-called magnetite electrodes and of a lamp suitable for burning them. A few points of comparison between these metallic-oxide electrodes and carbon electrodes will be considered, and some of the many interesting advantages possessed by the metallic-oxide electrodes and lamp will be touched on. Among these are the long life, high efficiency and good distribution and color of light.

The magnetite electrodes were so named because magnetite is usually one of the constituents of the negative or cathode, but it would be more satisfactory to call them metallic-oxide electrodes, as, in addition to the magnetite, there are always at least two other oxides present, namely, oxide of titanium and oxide of chromium.

These electrodes are made in a very different manner from the carbon electrodes. As is well known, the latter are squirted or molded from a plastic mixture and are baked; the carbon furnishing sufficient mechanical strength and electrical conductivity. A metallic-oxide electrode can not be made this way, for it is a familiar fact that a fine powder is a poor conductor, no matter of what it is composed, and as these electrodes are made for the most part from finely powdered oxides, it is evident that a conducting binder or a conducting case would have to be used. In practice, the mixture of oxides is tamped into a thin iron tube and the end sealed in an arc.

The oxides have distinct and separate reasons for their presence. The titanium oxide has the property of rendering the arc luminous; and it may be here noted that the metallic-oxide arc is a flame arc, the light not coming from a crater as with carbons. The oxide of iron gives conductivity to the fused mixture when cold, the other oxides being conductors only when hot. The oxide of chromium prevents a too-rapid consumption, so that by its use an electrode may be given a very long life.

The positive, or anode, used with these metallic-oxide negatives is generally a metal and is consumed much more slowly than the negative. This is contrary to what would be expected, judging by the action of carbon electrodes.

There are a number of advantages possessed by the metallic arc over the carbon arc. In the first place, the efficiency is much better; that is, a metallic arc lamp operating on a four-ampere current with approximately sixty-five to seventy volts at the arc will give a light equal or superior to that of a 6.6-ampere, seventy-five-volt, direct-current, enclosed-carbon arc lamp.

The distribution of light is far better. This is owing to the fact that in the enclosed-carbon arc practically all the light comes from the crater on the flat under-surface of the upper electrode, most of it being thrown down and not serving to illuminate the street between lamps. The light from the carbon arc itself is weak and of a blue color. This is very pronounced at times, especially if the flat under-surface of the upper electrode is somewhat inclined, thus hiding the crater. In the case of the metallic-oxide electrodes, the arc is itself the source of light, practically none coming from the crater, except by reflection. The metallic arc is much like a candle flame, having its luminous and non-luminous zones. The light is brightest near that end of the arc which is next to the negative electrode, and comes from a hollow cone-shaped mantle of volatilized oxide of titanium rendered incandescent by the heat of the arc, just as in the candle flame the light comes from a hollow cone-shaped mantle of carbon particles made white hot by the heat of the flame.

The voltage required to maintain a metallic arc is less than that of an enclosed-carbon arc. It is a familiar fact that an enclosed-carbon lamp will not burn properly with the arc voltage down to sixty-five, while a metallic arc will burn well at less than fifty-five. Metallic arcs are adjusted to burn at from sixty-five volts to seventy-five volts in different cases, while the carbon arcs are all set at eighty. This is a very evident advantage in favor of the metallic arc, as more lamps may be put on a circuit without raising the voltage on the line.

The life of carbon electrodes, as a rule, is not over 150 hours, while the metallic-oxide electrodes can go considerably longer.

The uniform white color of the metallic arc is in marked contrast to the changeable blue and white of the enclosed-carbon arc.

As the metallic-oxide electrodes are not burned "enclosed," there is no inner globe required on the lamp.

While it looked easy to secure all of these advantages, many difficulties ap-

[1] A paper read before the National Electric Light Association, Washington, D. C., June 5.

peared, but they have now practically all been overcome. In the first experiments the electrodes were trimmed with the anode or positive above and the negative or metallic-oxide electrode below, just as carbon lamps are trimmed, but a number of troubles presented themselves.

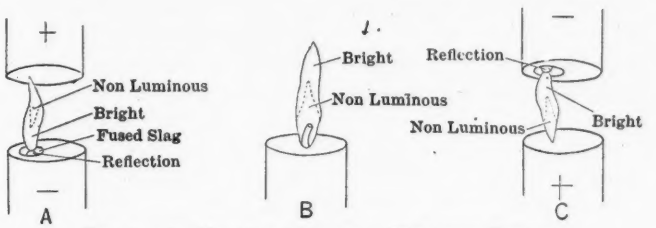


FIG. 1.—A—METALLIC ARC WITH NEGATIVE BELOW.
B—CANDLE FLAME.
C—METALLIC ARC WITH NEGATIVE ABOVE.

First—The bright portion of the arc was near the surface of the lower electrode, which cast a large shadow.

Second—The light reflected from the brilliant surface of the fused slag on the lower electrode was thrown upward and could only be partly saved by using a reflector.

Third—An under-feed mechanism was seen to be necessary, as, contrary to the action of carbon electrodes, the negative metallic-oxide electrode is the more rapidly consumed.

Fourth—Only a comparatively short metallic-oxide electrode could be used, as a long one would necessitate the use of an unwieldy long glass globe. This would limit the life and could only be met by adopting a negative electrode of large diameter, which it is evident would be undesirable.

Fifth—A particularly undesirable feature was the gathering of a large amount of reddish soot that would collect in spongy masses around the electrodes, obscuring the light. This had to be removed by some mechanical means, such as scraping or shaking it off, and some receptacle other than the glass globe had to be provided to catch it.

Sixth—The negative or metallic electrode was seen to burn to a blunt taper point, causing the arc to be very unsteady, as it tended to leave the end and run up the side in the manner of the carbon arc when flaming.

As noted above, the bright portion of the metallic arc is located near the surface of the negative electrode, and it was seen to be very desirable to burn the electrodes with the negative above, thus getting the bright portion of the arc in such a position that the shadow thrown down would be less, and that the light reflected from the brilliant surface of the fused pool of slag on the negative electrode would be thrown down and utilized instead of being thrown upward and wasted. The other advantages, noted above, possessed by the carbon lamp would be retained if this inverted position of the electrodes could be made practical.

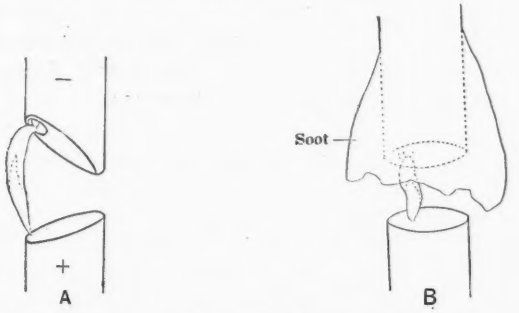


FIG. 2.—A—SHOWING HOW THE ENDS OF CARBONS WASTED AWAY TO A BEVEL BEFORE USING THE DOWN-DRAFT OF AIR.
B—SHOWING ACCUMULATION OF SPONGE-LIKE MASSES OF SOOT BEFORE USING THE DOWN-DRAFT OF AIR.

The first attempt to burn the metallic-oxide electrode above and the metallic electrode below showed that there were serious obstacles to be overcome before it could become a practical method. In the first place, the electrode would not keep a square end, but would waste away on one side, and the arc would run up this bevel, or slope, giving a very unsteady light. In the second place, the volatilized oxides of iron, chromium, titanium, and so forth would condense on the sides of the electrodes and hang down as a fringe or curtain, hiding the light.

The first means taken to overcome these troubles was the introduction of a rotating draft of air around the arc. This had the effect of forcing the arc to hold to a central position, stopped the crooked burning, and steadied the light, but did not take care of the fumes. Attempts to blow the fumes away sidewise gave only partial success. Finally, a current of air was directed down around the arc, and this gave excellent results. The electrode burned perfectly square, and the clean layer of air prevented any gathering of fumes. This was a very marked advance, as this did away with any need for a mechanical scraper or shaker, the soot practically all passing out of the chimney and not requiring to be caught in any receptacle, the globe remaining clean.

When burning metallic-oxide electrodes with the metallic-oxide stick below, copper

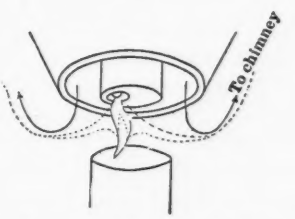


FIG. 3.—THE DOWN-DRAFT OF AIR FORCES THE SOOT TO TAKE THE PATH SHOWN BY THE DOTTED LINE, EFFECTUALLY KEEPING IT FROM TOUCHING OR DEPOSITING ON ANYTHING.

was used as an anode with fair results. On reversing the position of the electrodes, it was found that the new conditions made it possible to improve on the action of a pure copper anode, and a number of changes were accordingly made. In the first place, if the arc plays for a time on pure copper, it will oxidize the surface. This oxide will fuse to a slag that becomes an insulator when cold, and on starting a cold lamp it is necessary to strike the electrodes together hard enough to break through the slag. To strike such a hard blow is undesirable, as if it is done while the lamp is burning—for example, when feeding—it is liable to spatter the fused slag out on to the glass globe. A simple remedy for this consisted in using an anode containing metals or alloys whose oxides, when fused together, would make a slag that is a good conductor when cold. The steadiness of the light largely depends on the composition of the slag, its uniformity and temperature. The anode surface is at all times covered with this slag, which slowly dissolves the metal and is itself slowly volatilized. If the arc plays on bare metal it consumes it rapidly, and it was found desirable to secure this slag cover from being knocked off.

This was accomplished by providing a rough surface for it to cling to, and by running the entire anode tip very hot.

A characteristic property of the metallic arc has been a very noticeable dying-down or dimming of the light, which would occur at irregular intervals, especially after the electrodes had burned for twenty hours or more. These dim spells would last from a few seconds to two or three minutes, when the normal brilliancy would return. This is explained as follows: In the metallic arc, the brilliancy is largely due to the presence of volatilized oxide of titanium, and anything that interferes with the uniform evolution of vapors of titanium will cause the light to dim—for example, the presence of a high percentage of highly fusible oxide of chromium. This oxide of chromium is volatilized at a slower rate than the oxides of titanium and iron, and after the electrode has been burning some twenty hours the slag on the end of the cathode has become very rich in oxide of chromium, which forms a film on the surface of the fused pool of oxides. When the film is not present there is a plentiful evolution of oxides of iron and titanium, and there is a bright arc. The oxide of chromium can be seen to gather on and finally entirely cover the surface of the pool. This stops the evaporation of titanium and iron, and the light burns to a bluish color and dies down until the chromium film is burned away again. This trouble was met by modifying the mixture in such a way that the oxide of chromium could not separate from the oxides of iron and titanium, thus doing away with the film on the surface and entirely doing away with the dim spells.

In carbon lamps there was very little done to keep the impurities volatilized from the carbons from depositing on the globe. This trouble had to be met by the carbon manufacturers, who were prodded up to produce carbons containing less than 0.2 per cent of impurities, but this means was not to be considered in the case of the metallic-arc lamp. The metallic-arc electrodes, being chiefly composed of oxides of iron, titanium and chromium, do not burn away to an invisible gas, as does a carbon stick, but are volatilized bodily, and the vapors instantly condense, on leaving the arc, to a fluffy reddish soot that settles on everything it touches, so that a chimney is a very necessary feature in the lamp. This soot, if it comes in contact with the reflector or globe, will smudge them badly in ten minutes. As was noted before, a current of air flowing down around the electrode served admirably to keep it clean, so it was applied to the reflector and globe with gratifying results. A thin layer of air is introduced at the top of the reflector and forms a shield through which the soot-laden air can not penetrate, so that the reflector and globe will keep clean for a long time.

As the air currents play such an important part in this lamp, it became necessary to do a large amount of experimental work on the design of an air intake and of a chimney top. The chimney could not be made long enough to cause a very powerful draft, so the wind was very apt to blow down it; but by persistent effort the openings have been so designed that the wind may blow from any direction (up, down or sidewise), and the only effect is to increase the natural draft in the lamp. Incidentally, the increasing of this draft actually centres the arc and holds it remarkably quiet.

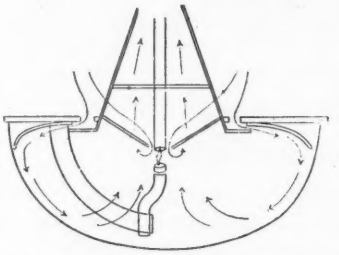


FIG. 4.—PATH TAKEN BY AIR CURRENTS IN LAMP.

It was found advisable to run the lamp at four amperes and sixty-five to sixty-eight volts at the arc with a cutout set at eighty-five. This low cutout was made possible by the inverted position of the electrodes and by the peculiar arrangement of the air draft, which prevented any tendency of the arc to flame or to run up the side of the electrode. Without these features, a cutout of 100 to 110 volts would be necessary. As the power-factor at which the lamps operate depends largely on the amount of variation of voltage in the arc, this eighty-five-volt cutout is seen to be very desirable. In actual service the lamps, including a mercury arc rectifier, run very well at from sixty-five to seventy per cent power-factor.

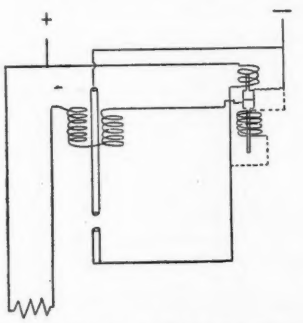


FIG. 5.—DIAGRAM OF CONNECTIONS.

In several places above we have described special conditions that must be obtained for getting the best results with these electrodes, and these conditions, of course, must be supplied by the lamp in which they are burned. An example of a lamp well adapted for this service is here shown. A study of its design and construction will show that it is simple and rugged, as no float feed is used; it being necessary only to strike an arc and hold the electrode in a permanent position until, due to change in voltage, the cutout causes the restriking of the arc. The lamp consists essentially of a base and top, connected by a chimney, a set of magnets for striking the arc, a shunt cutout for causing the lamp to feed due to rise in voltage, and a series cutout for disconnecting the striking magnets after the arc has been formed.

The special conditions described with regard to drafts are obtained as seen here by the down-draft tube, which directs the current of air down around the electrode, another current of air over the reflector and circling around the globe forming a means of protection to them, and a special construction of top and case for giving proper draft conditions when under all conditions of wind.

The Mechanical Design of a Standard Line of Electric Motors.

Suggestions are given in the *Electrical Review*, London May 24, by H. Luckin for standardizing electric motor design so as to reduce the number of parts necessary to produce a line of machines. With, say, twelve different sizes, but three diameters of armature should be selected, so as to reduce spare parts to one-third what would be required if each size had a different diameter. The various sizes may then be made up by choosing armatures of different lengths. This method calls for shafts and bearings somewhat larger for the smaller sizes of motors, but the difference is more than made up by the saving in stock. A standard shaft should be adopted, long enough to take a pinion. This can then be cut down for couplings and pulleys. For small sizes the shaft should be designed for a driving fit with a feather and the set screws at right angles. The feet of the machine should be attached to the yoke rather than to the end plates, thus enabling the motor to be placed on the wall, floor or ceiling. The terminals should be brought out so that the connections can be reversed without opening the motor.

AN UNGROUNDED, CLOSED CIRCUIT FOR RECEIVING WIRELESS SIGNALS.

BY GREENLEAF W. PICKARD.

In the reception of wireless signals, it has been quite generally supposed that some form of antenna, or elevated wire, and a ground connection or its electrical equivalent are necessary. It is true that

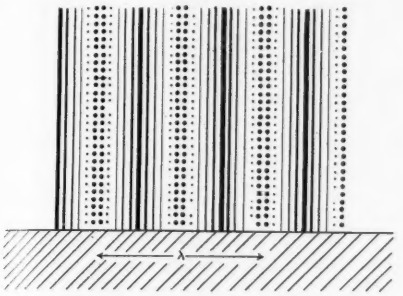


FIG. 1.—SECTION OF A PORTION OF A WAVE TRAIN MADE IN A VERTICAL PLANE INCLUDING THE SOURCE OR DISTANT TRANSMITTING STATION.

in certain systems a so-called "balancing" or "counterpoise" capacity is used in lieu of a direct ground, but consideration will show that as these capacities are in the vicinity of the earth's surface, the effect is simply that of a condenser, inserted in an earth connection.

The writer, from a consideration of the structure of an earth-attached electrical wave, has been led to try other methods of receiving, among these being a simple closed circuit, including a condenser for tuning purposes. To clearly illustrate the theory of its action, Fig. 1 shows a section of a portion of a wave train, made in the vertical plane including the source, or distant transmitting station. In this section, which includes only the lower portion of the waves, the electrical component, which in the immediate neighborhood of the earth's surface is normal thereto, is shown in full line, while the magnetic component, ninety degrees, or a quarter wave-length behind the electric component, is shown as a series of dots, which are in reality the cross sections of the magnetic lines, which run parallel with the earth's surface, and form closed circles around the transmitting station or source. The intensity of either component at any point is indicated roughly by the heaviness of line or dot.

As such a wave train passes an antenna of the conventional type, certain of the lines composing the electric component terminate momentarily on the antenna, and thereby raise or lower its potential with respect to earth. As the series of waves pass, a series of such potential changes in the antenna take place, resulting in a series of up-and-down surges of current between the antenna and its ground connection. At the same time, the antenna is cut by the magnetic lines in the waves, and an electromotive force is set up between its upper and lower terminals, cooperating with the electrically induced surge. But as this electromotive force exists only between the upper and lower terminals of the antenna itself, and not between the antenna and earth, it probably contributes little to the total effect in the detector circuit.

To use the magnetic component, it would be necessary to utilize the electromotive force set up in a conductor cut by the magnetic lines. By the use of a closed circuit, so placed as to include a maximum number of the lines in a section of the passing waves, and properly tuned, or made resonant to the frequency of the distant station, a highly efficient receiving circuit results, the amount of received energy being directly proportional to the enclosed area of the circuit. It is hardly necessary to dilate upon the advantages of such a circuit over the conventional antenna, as it is apparent that a long, low rectangle may be made of very considerable area, without the use of high masts. In fact, the only limitation is that the length shall not exceed a quarter wave-length, as with a length in excess of this the circuit would include lines passing through in opposite directions, which would partially cancel the total effect.

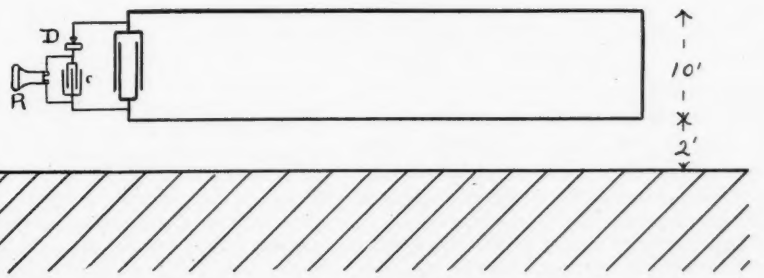


FIG. 2.—RECTANGULAR CLOSED CIRCUIT FOR RECEIVING WIRELESS TELEGRAPH SIGNALS.

In Fig. 2 is shown a rectangular closed circuit, constructed by the writer in his garden at Amesbury, Mass. The vertical plane of this rectangle is southeast by south, including the Marconi station at South Wellfleet, Mass., about ninety miles away. As shown in the sketch, the terminals of the rectangle are connected to a variable air condenser C, and in shunt with this is placed the thermo-junction detector, consisting of a brass point bearing upon a silicon surface[1]. The telephone receiver R is connected in shunt to a small fixed value condenser *c*, so that the telephone circuit through the detector is completed by the rectangle itself. This leaves the detector, as far as the received oscillations are concerned, without any capacity shunt, such as telephone leads, etc., and as this type of detector is of very high ohmic resistance, the circuit as a whole is left quite free to oscillate.

This rectangle received clear, distinct signals from Wellfleet, and, when the condenser was adjusted to give the maximum response in the telephone, the measured[2] intensity was found to be approximately 0.01 erg per dot. Considering the small dimensions of the rectangle, the strength of the received signals was rather surprising, particularly as the garden is surrounded by houses and trees, of many times the elevation of the rectangle itself.

To determine whether any portion of the received energy came from the electric component of the waves, a ground connection was made from various portions of the rectangle, at the sides, top and bottom. It was found that there was not the slightest observable effect upon either the tune of the circuit or the intensity of the signals, whatever the point grounded. It was further found immaterial whether the condenser and detector were placed at the end of the rectangle furthest from the transmitting station, the end nearest, or the middle of either the top or bottom horizontal wires.

Owing to the rectangular shape of the circuit, its inductance could readily be computed, and was found to be 106 microhenries. When in tune with the Wellfleet station, the capacity of the condenser was 0.0090 microfarad. These constants give a period of 163,000 cycles per second for the circuit, which is quite approximately that of the Wellfleet station, as determined by other and independent measurements.

A larger closed circuit of approximately

[1] See "Silicon Detector and Measurement of Wave Energy," by Maver, *Scientific American* Supplement, May 25, 1906.

[2] See "Measurement of Received Energy at Wireless Stations," by the writer, ELECTRICAL REVIEW, December 15, 1906.

five times the enclosed area of the above, but of irregular outline, with a measured inductance of 187 microhenries, placed in the same plane as the first, received 0.06 erg per dot from the Wellfleet station. As this measurement was made upon another day, the ratio it bore to the first is but an approximation to the ratio or efficiency of the two circuits, as the received energy on the same circuit varies widely from day to day. It does indicate, however, that the energy received is probably proportional to the enclosed area of the circuit. The limitation in the amount of energy received in this type of circuit is probably analogous to the limitation of the conventional type, in which the potential on the antenna can not exceed the space potential due to the passing waves, or else it would reradiate more energy than it received. Where the magnetic component is used, the intensity of the current set up in the circuit can not exceed a value which would give the same number of magnetic lines through the circuit as exist in the section of the passing wave intercepted by the circuit.

That the circuit is unaffected by waves originating at points at right angles with its vertical plane, was clearly shown by receiving signals from a steamer passing down the coast from Portland, Me., to New York. Signals could be clearly heard from this steamer when either north or south of a line northeast by north from Amesbury, but these signals became inaudible when the steamer was within a few degrees of this line.

In tuning the circuit to various stations, it was soon found that the best results were obtained by having only the inductance of the circuit wire itself included, and varying the condenser capacity. While very sharp tuning could be accomplished by a fixed value of condenser, and an inserted, variable inductance, the intensity of the response steadily decreased as the inductance increased, although the circuit was kept in perfect tune. This was true, whether the detector was directly linked with the circuit by being placed in shunt to the condenser, or inductively linked through an oscillation transformer.

This circuit is not alone interesting as one solely utilizing the magnetic component of the electromagnetic waves employed in wireless telegraphy, but it forms a practical receiving circuit, capable of operating, as the writer has determined by extensive tests, over the longest distances at present covered by wireless communication. As elevation is not essential, it is inexpensive to erect, and the fact that it is directive in its action, *i. e.*, will only receive efficiently from stations in its own plane, and not at all from stations at right angles thereto, is of distinct value in certain cases. Using a rectangle mounted in such manner as to rotate, it forms an excellent direction finder, as the null point, when the plane of the circuit is at right angles to the source of the waves, is very sharp.

A New Lamp Filament.

A British patent recently issued to Walther Nernst and Lorentz Stockem gives details of a new incandescent lamp filament, which are reprinted in *Electrical Engineering* (London), May 23, and from which the following matter is taken:

Incandescence filaments made of conductors of the second class, will only conduct the electric current after having been previously warmed. This heating has hitherto been accomplished with the aid of a special heating device. In order to avoid this, attempts have repeatedly been made to make incandescence lamp filaments of a mixture of conductors of the first and second classes. Thus, for instance, mixtures of tungsten with second-class conducting substances, or of tantalum, tantalic acid and oxide of zirconium have been employed. These bodies may be said to contain both the heating medium and the illuminating agent of the Nernst lamp, combined in a single filament, but it was found that the life of the lamp, with a good illuminating effect, was very short. We have found that a good illuminating body of sufficient durability is obtained from tungstate of thorium or of zirconium or the like second-class conductor; such a tungstate being obtained by chemical action between chemical compounds of tungsten, such as oxide, chloride or nitride of tungsten, or tungsten alloys or combinations, with a second-class conductor, such as thorium oxide, oxide of zirconium and yttria, or the like rare earth.

Incandescence bodies of this class must be employed in vacuum lamps or in an indifferent atmosphere, otherwise the tungsten or its alloys are liable to be burnt or to change their nature. We have also found that these lamps should preferably be employed in connection with an alternating current. Since disturbances in the working easily occur, when the lamps are subjected to great strain, by sudden variations of temperature due to a decrease of the conductivity of the material at very high temperatures, it is advisable to switch in, in front, a cushion resistance, for which purpose iron resistances have shown themselves to be very effective. In carrying the invention into practice, in place of using plain mixtures of the tungsten metal with conductors of the second class, we employ preparations produced by mixing, and then causing the chemical union of, a tungsten compound or combination, such, for instance, as oxide, chloride or nitride of tungsten, or the like, with conductors of the second class, as, for instance, thorium oxide, and then heating the compound thus obtained in the presence of reducing gases. For this purpose hydrogen is advantageously employed. The compound thus obtained, together with the subsequent addition of fresh quantities of first and second-class conductors, if this should be necessary in order to attain a certain desired conductivity, are then reduced to suitable shape, for instance, to filaments. They may, of course, be shaped before the reduction takes place.

We have found that the best results may be attained in the following manner: The constituent parts of the mixture should be so chosen that they can be readily caused, by heat, to enter into chemical combination with each other, as it will be found that the better the distribution of the conductors of the first class in those of the second class the better will be the result attained. As an example: Oxide of thorium or zirconium is melted together with tungstic acid in an iridium crucible, or one of a material capable of withstanding high temperatures, in an oxyhydrogen blow-pipe, in such proportions as to produce thorium or zirconium tungstate according to the following formula:

$$ThO_2 + 2WO_3 = ThW_2O_8$$
$$ZrO_2 + 2WO_3 = ZrW_2O_8$$

These tungstates were hitherto unknown. They are bodies of a greenish color, which melt at a very high temperature. The tungstates are very finely pulverized and heated in a reducing atmosphere. In doing this, the color changes gradually from pale green to dark blue, then to brown, and finally to black. The tungsten combination is reduced to metallic tungsten, and thorium or zirconium oxide remains unchanged. In this manner a very fine powder is obtained, in which the tungsten and the conductors of the second class are present in the most intimate distribution possible. The molten masses are capable of dissolving superfluous constituent parts or of retaining them in fine distribution, so that in this manner preparations may be obtained which, according to requirement, contain more tungsten or more of the conductors of the second class. The incandescence bodies obtained from the mixtures of conductors of the first and second classes according to the above-described process are of a singularly even structure and the process facilitates the production of goods of a very even, unchanging quality.

Claims: For electric lamps, an incandescence body obtained from a tungstate of thorium or of zirconium or the like second-class conductor which has been heated in a reducing atmosphere, for the purpose stated.

The Cleveland Municipal Electric Lighting Plant.

The annexation of the village of South Brooklyn to the city of Cleveland, Ohio, brought with it a small municipal electric lighting plant, which originally consisted of one 150-kilowatt 2,200-volt alternator. This unit was amply large to take care of the village arc lighting system; later, however, in order to take care of the increasing demand for commercial lighting, another sixty-kilowatt, 2,200-volt, belted alternator was added.

This small lighting plant proved a success under the management of the board of public service of the city of Cleveland, as is shown by the fact that during the year 1906 it netted the city a clear profit of about $1,553 after deducting all operating expenses, interest, ten per cent for depreciation and four per cent for taxes.

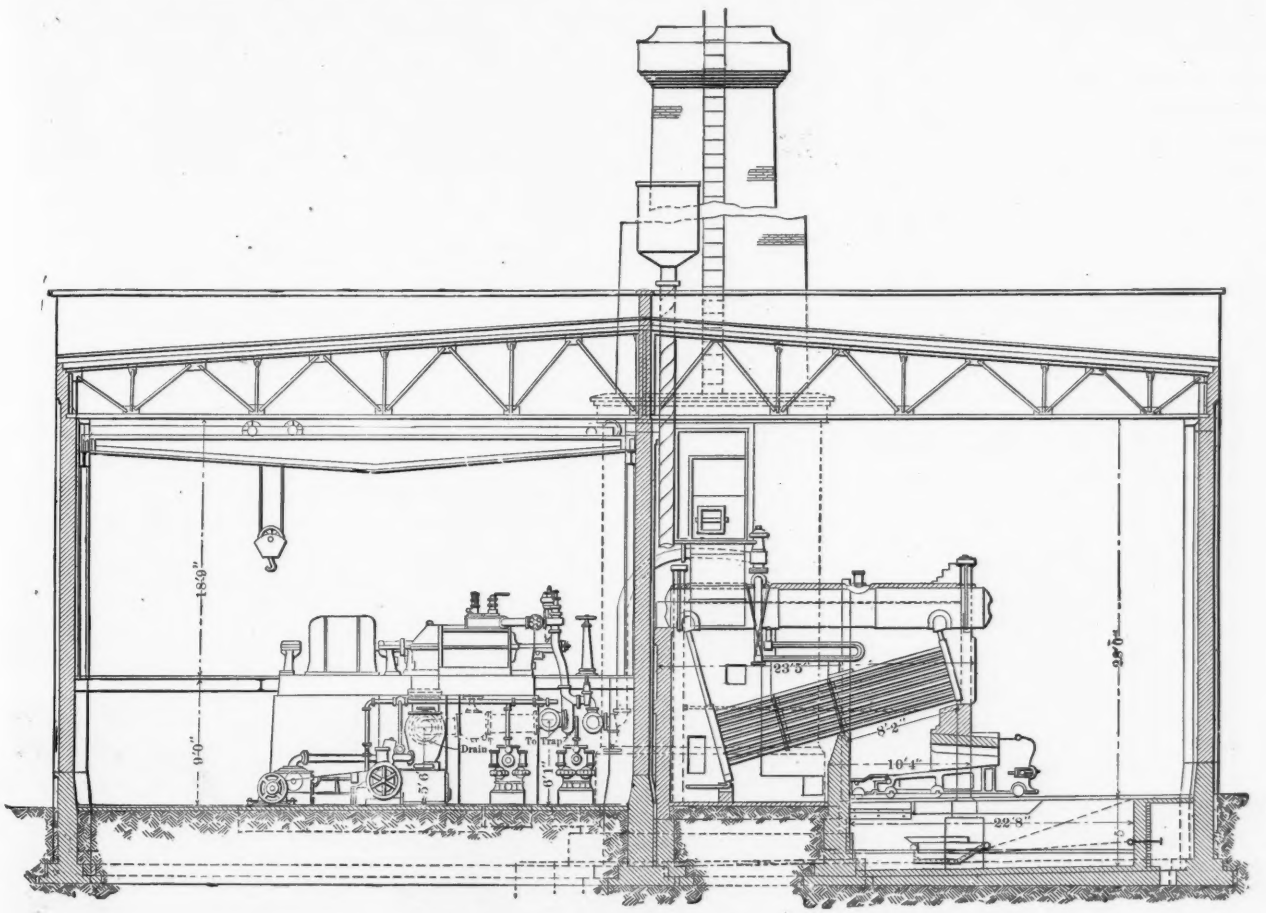
The plant at this time took care of about 233 arc lamps, the balance of the output available being used for commercial lighting. As the demand on this plant had long outgrown its capacity, the council, encouraged by the success already attained, appropriated enough funds to build a new plant to be equipped with the most modern and efficient apparatus obtainable. The new plant went into active service in March this year.

The power-house is situated near the tracks of the Baltimore & Ohio Railroad, some distance from the old plant, the site being part of property turned over to the city at the time of the annexation.

The foundation of the power-house covers an area of 7,655 square feet, eighty-nine and one-half feet by eighty-five and one-half feet, and is built entirely of concrete to a depth of six feet, resting on solid shale. On this foundation a brick building was erected, provided with steel roof trusses and fireproof roofing.

Outside of the power-house, near the north end, a Weber steel-concrete chimney rises to a height of 150 feet above the foundation; the inside diameter of the chimney is six feet six inches, and it connects to the boilers with a smoke-flue, eight feet by five inches, at a height of twenty-one feet from the boiler-room floor. The smoke-flue inside the boiler house is made of iron and hung from the steel trusses over the boilers; between the chimney and the power-house the flue is built of brick and cement and reinforced by steel rails.

The boiler room is separated from the remaining part of the power-house by a brick wall running its full length and contains two Babcock & Wilcox water-tube boilers, each of 265-horse-power rating, leaving space available for four additional boilers of the same capacity. These boilers have a heating surface of ten square feet per boiler horse-power, and are designed for a working pressure of 160 pounds; they are provided with superheaters guaranteed to maintain 125 degrees superheat of the steam.



Cleveland Municipal Electric Light Plant. Cross-Section Showing Arrangement of Principal Apparatus.

Chain grate-stokers were selected and were supplied by the American Stoker Company; they are of their No. 25 size and provided with clinker breakers.

The coal is brought on cars, dumped and stored in front of the boiler room; an elevated siding running the full length of the boiler house having been built for that purpose. From the storage the coal is then distributed to the various boilers by means of a small industrial railway.

All ashes deposit in a tray running the

full length under the boilers and are brought outside the building by a scraper conveyer.

The boilers are fitted with seven-inch non-return automatic emergency stop-valves and Williams feed-water columns and regulators.

The turbine room, situated back of the boiler room, consists of one floor and basement; at present only one is installed, this being a Westinghouse 500-kilowatt turbo-alternator, but there is room for two more units of the same size. The turbine is the Westinghouse Machine Company's standard make, and is rated at 750 horse-power at a speed of 3,600 revolutions per minute; it is to operate under a steam pressure of 150 pounds with 125 degrees superheat and a vacuum of twenty-six inches.

This turbine is direct-connected to a three-phase revolving field-alternator of sixty cycles, 2,300 volts and 126 amperes capacity.

The following table gives the turbine guarantees furnished by the builders:

STEAM CONSUMPTION.

Vacuum.	Turbine Speed.	Pounds of Steam per Kilowatt-Hour at Various Loads.							
		125° Superheated Steam.				Saturated Steam.			
		50%	75%	100%	125%	50%	75%	100%	125%
26"	3,600	24.4	21.5	19.9	20.3	27.5	24.2	22.4	20.9
28"	3,600	21.3	19.8	14.75	16.0	24.6	22.3	21.0	21.5

The alternator efficiencies at different loads are as follows:

ALTERNATING EFFICIENCY.

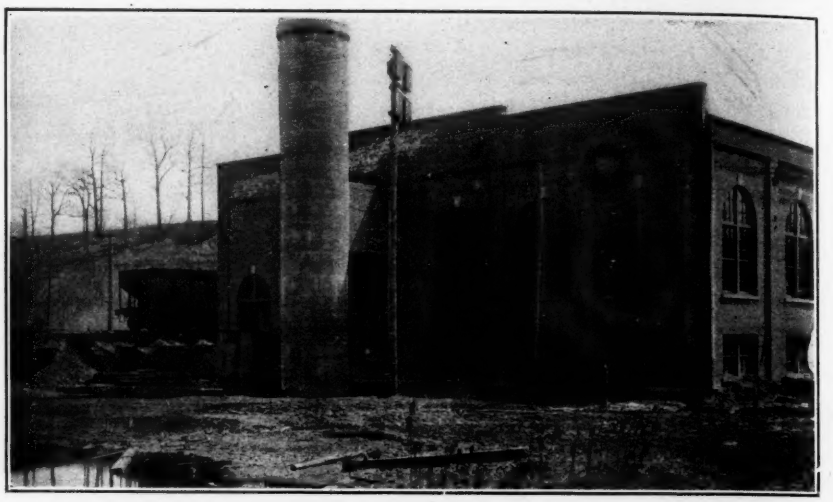
Per cent load	50	75	100	125
Efficiency	92¼	94	95	95½

Excitation for the alternator is furnished by a twelve and one-half kilowatt 125-volt generator, belted to a Westinghouse standard engine. The speed of the exciter is 1,100 revolutions per minute, and efficiencies for various loads are guaranteed as follows:

Per cent load	50	75	100
Efficiency	82.5	85	85.7

The exciter unit is located in the basement under the turbine-room floor, where are as well located the condensing outfit, feed-water pumps and feed-water heater.

The condensing apparatus consists of a thirteen and sixteen by sixteen-inch Wheeler jet condenser with dry and wet vacuum pumps. This arrangement was selected as it is proposed to discharge the condensed steam through a system of piping and spraying nozzles erected over a pond located at some distance from the power-house; the condensing water is then sufficiently cooled to be used over again and a vacuum of from twenty-six to twenty-seven inches is easily maintained.



EXTERIOR VIEW, CLEVELAND, OHIO, MUNICIPAL PLANT.

Two Snider & Hughes eight by five and one-half by twelve inches boiler feed pumps are installed, each pump being capable of taking care of the entire present boiler capacity. The pumps are of the double-acting, end-packed, plunger-type, and designed for the pumping of fifty gallons of water per minute at a piston speed of twenty-five feet per minute.

All auxiliaries discharge their exhaust steam through a Lowe Manufacturing Company's closed feed-water heater, provided with water tubes of seamless drawn copper mounted in a cast-iron shell.

The feed-water for the boilers is taken from the city mains and discharged into an iron storage tank embedded in the basement floor; the capacity of the tank is about 2,000 gallons.

From this tank the water is then taken by the pumps and forced through the feed-water heater to the boilers.

The entire steam fitting was carried out by the Water Works Construction Company, of Cleveland, and executed under the most rigid specifications. All steam

SWITCHBOARD, CLEVELAND, OHIO, MUNICIPAL PLANT.

and water pipes exposed to a pressure of 100 pounds or over are of extra heavy lap-welded wrought-iron or steel pipe designed for a factor of safety of six; all cast-iron pipes and fittings have a factor of safety of eight. The feed-water piping and all pipes in connection with the feed-water controllers are of extra heavy brass pipe. Crane extra heavy cast iron flange connections are used throughout, and Crane standard high-pressure valves and fittings are employed throughout the entire installation.

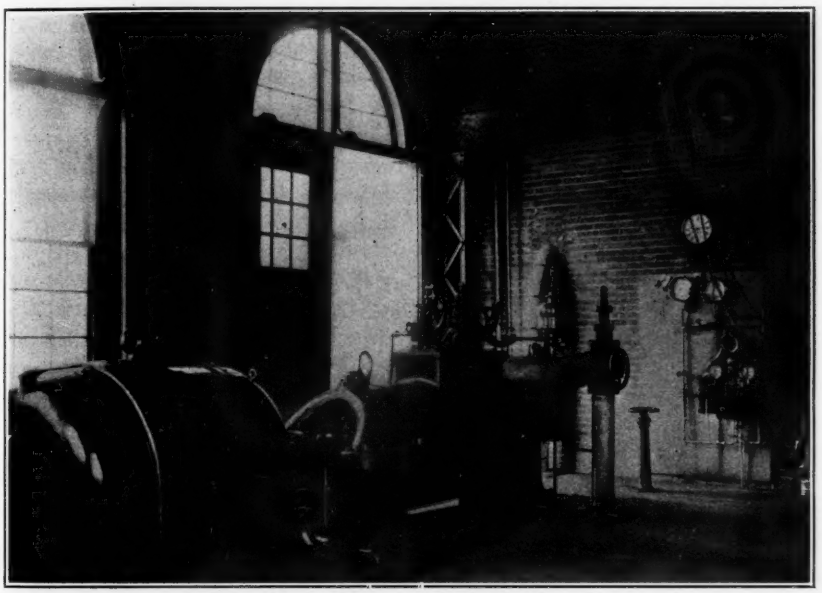
The complete pipe-lines were tested under a hydrostatic pressure of 200 pounds to the square inch for all high-pressure work, under a pressure of 150 pounds for all cold-water lines and under a pressure of fifty pounds for all exhaust and blow-off piping.

All steam apparatus draw steam from a ten-inch header located in the basement under the turbine-room floor; this steam header is connected with the boilers by two seven-inch pipe bends provided with high-pressure gate-valves. A five-inch pipe-line connects the turbine with the header through a Swartwout steam separator and a five-inch gate-valve, which is operated by a hand-wheel from the turbine room above. A three and one-half inch branch main supplies the various auxiliaries.

The free exhaust from the turbine is led through a Davis free-exhaust valve and a twelve-inch spiral riveted pipe to the atmosphere; the free-exhaust pipe terminates in a Swartwout exhaust head. All steam and hot-water piping are covered with eighty-five per cent magnesia lagging.

The switchboard at present consists of five panels: one Westinghouse generator panel provided with three ammeters, wattmeter and oil-switch; one Westinghouse exciter panel provided with ammeter, voltmeter and switch, and three Adams-Bagnall series arc-light distributing panels, provided with the usual instruments.

In the turbine room are located the Adams-Bagnall constant-current regulators; each regulator is provided with a Kuhlman transformer wound for 2,300 volts primary and 5,600 volts secondary.



VIEW IN ENGINE ROOM, CLEVELAND, OHIO, MUNICIPAL ELECTRIC PLANT.

The whole plant has been designed with a view of obtaining the highest possible economy as well as efficiency and promises to come up to all expectations.

The following are the city officials through whose efforts are due the success of this enterprise: Mayor Tom L. Johnson, W. J. Springborn, Dan E. Leslie and H. R. Cooly, members of the board of public service; Superintendent of Lighting L. C. Smith has supervised the actual installation, in connection with C. E. F. Ahlm as consulting engineer for the city, who also prepared all plans and specifications for the entire installation.

Allis-Chalmers Company Secures Large Order for Gas Engines.

A large order for gas engines has recently been awarded by the United States Steel Corporation to the Allis-Chalmers Company, Milwaukee, Wis.

Within the past year this company has taken orders for thirty-six gas engines of 4,000 horse-power each, or an aggregate of 144,000 horse-power, twenty-five of which are to be installed as a part of the new plant now in course of construction by the steel corporation at Gary, Ind.; seven for the Homestead plant of the Carnegie Steel Company and four in the South Chicago works of the Illinois Steel Company.

These large gas engines weigh 1,500,000 pounds apiece. Their great size is also demonstrated by the fact that the shaft of each measures three feet in diameter. It will require 2,300 cars to transport these machines from the works of the Milwaukee company to the different plants of the steel corporation, where they will be installed.

The wide use of gas engines by the United States Steel Corporation marks an important step in the progress of steel manufacture in this country, as they are designed to operate upon the hitherto "waste" gas developed by the blast furnaces; thus inaugurating an important economy in steel production.

The majority of the Allis-Chalmers gas engines on order will drive electric generators of standard Allis-Chalmers type, twenty-five-cycle, three-phase. These machines are to be used for generating the necessary power to operate the heavy induction motor-driven rolls, the tilting and feed tables for the various passes, the hot saws, hot and cold pull-ups, transfer tables, straightening machines, and cold saws, and other auxiliary machinery of the mills which are now ordinarily operated by means of steam power.

In addition to the gas-driven electrical units, orders have also been placed with the Allis-Chalmers Company for twelve gas-driven blowing machines. The Indiana Steel Company, Gary plant, will have eight blowing engines, and the Homestead plant of the Carnegie Steel Company has ordered the remaining four units. Each blowing engine has a capacity of 3,500 horse-power, and will deliver 30,000 cubic feet of free air per minute against a pressure of eighteen pounds per square inch, which is ordinarily the maximum. All of the gas-driven blowing engines purchased by the steel company's plants will be equipped with "Slick" type blowing tubs, the American patent rights covering which are owned by Allis-Chalmers Company.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

A Colonial Electrical Engineering Laboratory.

A description is given here of an engineering building given to the South African College, at Capetown, South Africa, by the corporation of that city. This building is 110 feet in length, with an average width of sixty feet, and contains two floors. The ground floor consists of the civil, mechanical and electrical engineering laboratories and students' engineering library. The basement comprises the boiler plant, forge shop and foundry. On the second floor are two lecture rooms, with preparation rooms, offices and photographic laboratory. There is also a drafting room for a class of eighty, and the instrument testing and standardizing laboratory. The electrical engineering laboratory is equipped with a twelve-kilowatt, 440 to 220-volt motor-generator, drawing its supply from the town system. This supplies the current used in the laboratory, all the dynamos being driven by corresponding motors. There are here a ten-kilowatt rotary converter for single, two, three or six phases, a five-kilowatt alternator similarly arranged, a single and a three-phase induction motor, several direct-current machines, and a number of electrically driven tools. There is an elaborate slate switchboard for distributing current throughout the laboratory to the piers where the several machines are mounted. In the mechanical laboratory there are a number of generators driven by engines, among these being a 2,000-volt alternator and a twelve-kilowatt direct-current machine. There is also in the basement a 120-cell storage battery with an output of 120 ampere-hours at a twenty-ampere discharge rate. There is a meter-testing room adjoining the battery room, and the laboratory is well equipped with electrical instruments for all the usual tests.—*Abstracted from Electrical Engineering* (*London*), *May* 23.

The Law of Economical Proportion as Applied to Tramway Rolling Stock.

It is believed by W. R. Bowker that sufficient consideration has not been given to the selection of different types of street railway cars in order to secure the most economical service. He points out the significance of Kelvin's law giving the most economical capital outlay for electrical conductors, and says that the same law could be adapted to determine the proper proportions of different types of cars for any particular service. The fundamental conditions involved are the initial cost of each car, the power expenses for running it, the labor expenses, the interest on the capital outlay, depreciation, maintenance and renewals. Reliable data are obtainable on several of the above factors, so that it should not be very difficult, under given conditions, to apply the law. Without doing this, he points out the advantages and disadvantages of the different types of car, and says that, under general conditions, but three types will be needed—the double-deck car for summer use; the single-deck all-enclosed type, and the combination single-deck car. He criticizes the general adoption of the large double-deck car, in England, and contrasts this with the single-deck car which is the standard in this country and in continental Europe. Several classes of service are assumed, and what are considered to be the proper proportions of the different types are given. He believes that for general all-around service the combination car is the nearest approach to the ideal, and there is seldom any excuse for using the large double-deck car, particularly if it has no top covering. He strongly advocates a more general adoption of the single-deck car, and, in his opinion, under ordinary circumstances one type—the combination single-deck car—covers the economical law of proportion.—*Abstracted from Cassier's Magazine* (*New York*), *June.*

Electrical Transmission of Pictures.

In a review of the work done by a number of inventors to develop a satisfactory means of transmitting pictures electrically, a description is given of the elements sensitive to light which are utilized for this purpose. Two of the most successful of these have been developed by Ruhmer. One of these, designed especially for optical radiotelephony, consists of a cylindrical support, upon which two platinum wires are wound parallel to one another, the space between them being filled with selenium. Another element is designed to give great sensitiveness, and to obtain this, the platinum wires must be very close together. The support consists of two lenticular surfaces placed with their plane faces together, and grooved to receive the wires which are wound around them. These are then covered with the selenium and heated to convert it into the desired crystalline form. As the support consists of two parts, which can be slipped one over the other, this enables the platinum wires to be kept taut during heating, and thus retain their parallelism. In this way they can be placed much closer together than would otherwise be possible, so that the resistance of the layer of selenium is thus reduced. In his work on these elements, Ruhmer distinguishes between two types—the delicate and the durable. The difference between these results from the method in which the selenium is crystallized. The first is sensitive to small changes of low intensity, and the latter to changes of intense light. If the temperature be low, selenium forms in crystalline masses. When it is too high, drops are formed, so that in converting it into the crystalline condition it is necessary to work slowly up to 210 or 220 degrees centigrade. It is then cooled quickly, reheated again to 120 degrees, then raised gradually until it just begins to fuse, and then it is allowed to cool and reheated again for some hours at 200 degrees. Finally, it is allowed to solidify, and the temperature is reduced very gradually, but a few degrees each hour. This treatment reduces selenium to large grains, which is the most delicate type. The durable type has a fine grain, and is obtained in the first stages of the above treatment.—*Translated and abstracted from L'Électricien* (*Paris*), *May* 25.

Simple Zero Methods for the Detection of Leakage Factors.

To secure the accuracy of a zero method of measurement for determining magnetic leakage in electrical machines, Goldschmidt devised a method in which the turns on the field and armature were connected in series with a ballistic galvanometer, and then the number of turns in one or the other coil was varied until the electromotive force induced in one coil by opening the field circuit was just balanced

by that induced in the other. This method is simple and quick, but is only accurate when a large number of turns is used in each coil. At least 100 turns must be employed in order to give an accuracy of one per cent. When this is done, the system loses much of its simplicity and requires a more sensitive galvanometer. To get around these objections, Dr. R. Pohl has devised two methods, which are simple, quick and accurate. One or two turns of wire are placed around the field of the machine and the armature, and these are connected so that the electromotive forces induced are in the same direction. In this circuit is connected a Wheatstone bridge box. A sensitive ballistic galvanometer is connected from the middle point of the bridge to the junction between the two coils, and the resistances in the two arms of the bridge are then varied until there is no kick in the galvanometer when the field circuit is opened. When this is the case, the leakage coefficient is given by the ratio between the resistances in the two arms of the bridge. With a large machine, but one turn is necessary in each coil; with smaller machines, two or more may be required. The accuracy of the test depends, of course, upon the sensitiveness of the galvanometer, but may be compared with that of ordinary Wheatstone bridge measurements. A still more sensitive method than this consists in placing the same number of turns on the field and armature, again connecting the field coils across the outer terminals of the Wheatstone bridge, and the armature turns in series with the galvanometer or milli-voltmeter to one outer and one middle terminal of the bridge. Then the resistances in the two arms are varied until there is no deflection in the galvanometer, when the leakage coefficient is again given by the ratio of the resistances. This method is accurate, and may be compared with the usual use of the bridge as a potentiometer. If a sensitive galvanometer be not at hand, a milli-voltmeter or other similar instrument may be employed, and a sufficient number of turns placed in each coil in order to secure a sufficient electromotive force to deflect the instrument.—*Abstracted from the Electrician (London), May 24.*

The Properties and Use of Mineral Lubricating Oils.

Probably no other questions connected with the operation of machinery are so poorly understood by engineers, as a class, as those involved in the selection of a lubricant for any special work. This is the opinion of P. F. Walker, who says that what has proved good in one place may not do so in another, or may not do as well as some other that may be found. A common failing of engineers is to conclude that an oil is the best which prevents a bearing from giving trouble by heating, has good lasting qualities and costs little, without taking the trouble to find out if it is superior to other reliable brands in friction-reducing qualities. What is needed is some simple test, to be applied easily and quickly, which will give some positive information as to the real value of the lubricant. Many practical men attach too little importance to friction tests for lubricants on special machines, although these tests, if not properly conducted, are likely to be unreliable, for, giving frictional resistance, they do, in general, give comparative results, which are indications of the values of different oils in reducing friction. In such machines the vital conditions of pressure on the bearing and relative speed of the surfaces may be realized, and thus far the tests may be secured. It is essential in such tests to see to it that the supply of lubricant is positive and perfect, and, second, to secure good control of the temperature of the oil on a bearing. The first may be secured by submerging the bearing or flooding it with oil. The second condition is more difficult to reach, and can only be approached approximately. It should be remembered that there are no laws of friction for imperfectly lubricated surfaces, and therefore it is useless to test oil for friction under anything but standard conditions. The author then discusses the usual tests of oil—the flash test, viscosity, etc.—pointing out the value of these. The flash test is particularly important, because the low limit of temperature permissible for the flashing point of oil to be used on bearings is not a definitely fixed value; it must depend upon the conditions at the bearings. In places where heating is at all likely to occur in a noticeable degree, the safety of the bearing demands that oil should retain its lubricating qualities at comparatively high temperatures. Since the temperature of the oil film is always much in excess of that which can be measured in the metal body of the bearings, the safe limit for flashing is higher than might at first be supposed. A figure sometimes mentioned is 300 degrees Fahrenheit, but this is too low for most cases of high-grade machinery. These considerations are based on the power of an oil to lubricate. There is, however, a matter of greater moment than this—greater because the condition is more commonly realized. At temperatures only moderately high the loss of oil by evaporation becomes considerable. If this evaporation is sufficiently rapid it will cause gumming, and a gradual increase in the viscosity, which means an increasing friction loss, followed by greater heating and faster evaporation in accumulated matter. This occasions a greater consumption of oil, and in continuous systems of lubrication, where the oil is used over and over again, it is especially harmful. In crank engine cases the temperature may become comparatively high, and a volatile oil will gradually change in its friction-reducing qualities, to the detriment of the engine, and the ultimate waste of a large amount of oil. Results of tests on three samples of oil are given, showing the greater evaporation of those having the low flash points. For oil to be a good lubricant, it should have the least viscosity consistent with the pressure to be sustained, the ability to form thick films, readiness in forming films over metal surfaces, the power to resist rupture, and a flashing temperature sufficiently high to avoid loss by evaporation. The greater the viscosity, the greater, of course, the friction within the metal itself. Surface tensions are important, although seldom determined, since they show the ability of the oil to maintain itself within the bearing. This property may be easily measured by means of a glass rod suspended from a chemical balance. It should be remembered that these properties of an oil change with the temperature, and one giving satisfactory lubrication at a low temperature will not be so satisfactory at a higher. This is true also with respect to the variations in bearing pressure, for up to certain pressures that oil having the least viscosity will give the lowest coefficient of friction, while above this an oil having greater viscosity will probably give a lower coefficient. The author insists upon the need of more work in all phases of the oil question, and especially in the study of the film-forming properties of the oil, by means of which it is enabled to wet the bearing surfaces.—*Abstracted from the Engineering Magazine (New York), June.*

Copper is the name of a new monthly devoted exclusively to the interests of the copper industries. The first issue, June, has thirty-two pages of interesting illustrated matter. The magazine will be published by the Copper Publishing Company, New York city. The editor is David A. Curtis.

Methods of Getting New Business

A DEPARTMENT DEVOTED to the COMMERCIAL DEVELOPMENT of CENTRAL STATIONS

Managers are Invited to Contribute Suggestions for Methods of Increasing the Demand for Electric Service

EDITED BY CHARLES A. PARKER.

Ginger Talk to Solicitors by a Man in the Field.

This week we publish an article written especially for this department by E. Creed, a well-known, alert and successful solicitor for the Narragansett Electric Lighting Company, of Providence, R. I. He gives solicitors some good, practical, hard-headed advice, founded upon his wide experience in the field.

The article is as follows:

Soliciting new business for an electric lighting company is a very pleasant and profitable occupation. The work requires tact, diplomacy, energy and perseverance. Without these four qualities, no man can hope for success.

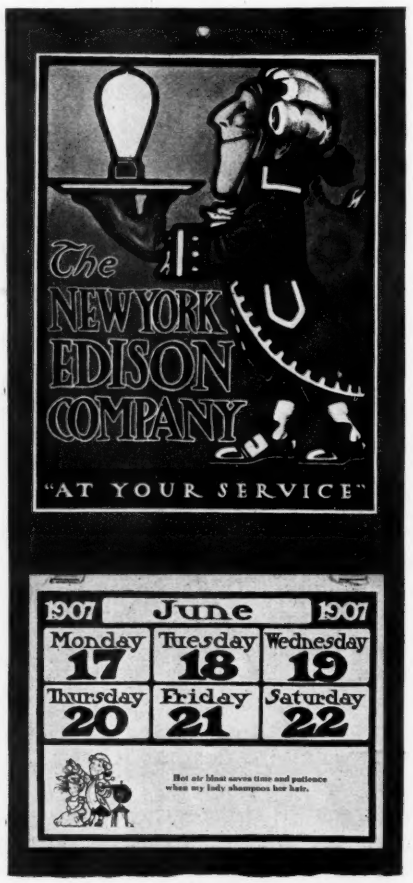
A solicitor must feel proud of his position. Eliminate the idea that you are doing something beneath you. Every merchant, banker, broker or dealer is a solicitor. He is soliciting new business daily. Every advertisement published by any of the great department stores is merely a solicitation for new business.

Securing a man's contract to wire his house, to install an electric flat-iron or heating appliance, or to use a motor, is as important, all things considered, as to take his order for a locomotive, the closing of a contract for a $6,000 engine, or the building of a power station.

When on the field, work from house to house, store to store, office to office. Do not skip around. Finish one block, then try the next. Of course, when "calling back," you will use your own judgment, but on straight canvassing, be methodical. Sometimes the most unpromising places in appearance are the very ones with which you will be most successful.

If you find a consumer along your route, get after him for more lamps, heating apparatus, etc. If he complains of poor service, etc., give him due attention, report his complaint to the office, and see that the matter is given attention.

In soliciting the occupants of dwellings, never, never, never go to the back door. You are representing a large corporation. You are selling the most necessary natural commodity ever harnessed by man for his comfort and convenience. You are an educator in a way, but it is not your business to educate domestic servants, gas-stove engineers, laundresses or chambermaids. There is nothing so cheapens a canvasser in the eyes of the average middle-class woman as to have him walk around to the back door. Tackle the front always. Let this be your motto: "Get to the front." If a servant receives you, ask for Mrs. So and So. If the nature of your business is requested, answer that it is of a personal character, keeping a smiling countenance the while, gradually working your way in. Keep up a good front, and remember the hardest house to enter is ofttimes the easiest to land.



An elaborate calendar, tabulated in weeks, gotten out by the New York Edison Company. On each weekly sheet appears a neat and suggestive illustration, and this illustration is accompanied by a pointed paragraph boosting electricity in all its various uses.

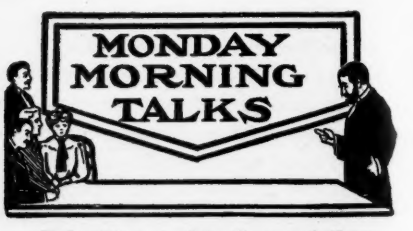
The writer has been and is now a solicitor. He has secured contracts from bankers, lawyers, miners, milliners, manufacturers and others, so he feels he knows whereof he writes, and he can honestly say that he is advising along practical lines.

Before approaching a house, secure the name of the occupant. Never ask for the "lady of the house"—that's a soap peddler's call. It's been worked to death. Originate something new if you can't secure the name.

A good introductory talk may be as follows: The company is about to extend its service for the benefit of the residents of the district, and their cooperation is requested to the extent that they have their houses wired for electric service; that the company has been put to great expense in erecting poles, stringing wires, etc., and that an investment of $60 would multiply itself tenfold in valuing the property. You will then be able to get in the arguments that you have at your command. If your prospect be not convinced on the first call, try again and again.

You won't land them all. If it were a question of handing you the contract when you called, why, a two-cent stamp or a dime messenger would do; but you will land a great number.

It means HUSTLE, not only with a capital "H," but every letter in the word must be capped.



Under this general heading we shall present to our readers a series of bright, stimulating talks to solicitors, which, we believe, will prove valuable to managers of new-business departments in suggesting points which they can profitably bring out in their occasional meetings with the company's representatives.

We shall gratefully accept contributions and suggestions from any of our readers.

A prominent writer says, "The stumbling block of timidity lies in front of the abyss of failure."

That very thought can furnish a moral for many of you solicitors; that very truth should sink deep into every one's heart here to-day.

The timid man can not be a successful solicitor, because the timid man has not

the nerve, courage or progressiveness the successful solicitor must have.

Do you know what I think of the solicitor who is inclined to be timid? I believe he is more scared than hurt; uses his imagination until that small obstacle has grown (in his mind) into a great, towering, bulky thing.

My experience has been that a man's imagination works overtime, sometimes.

I remember when I first started soliciting what a horror I had of calling on the big concerns. Imagined they were so big that *my* feeble efforts to interest them wouldn't make much of an impression.

You see, I hadn't confidence in my abilities—was too timid.

Did I get over that? Well—when our old manager got hold of me and found out what the trouble was—when he found my imagination was growing the wrong way, and I was making mountains out of molehills—then he said things to me that had an inclination to stiffen my backbone and chase all this timid feeling out of my system for sure.

After that when I had my nerve and called on these same prospects, I found most of them anything but what I had imagined.

They were human. They wanted to do business when the proposition was put to them right by a man who wasn't afraid to state his case. And some of these very concerns are among the biggest users of power we have on our books to-day.

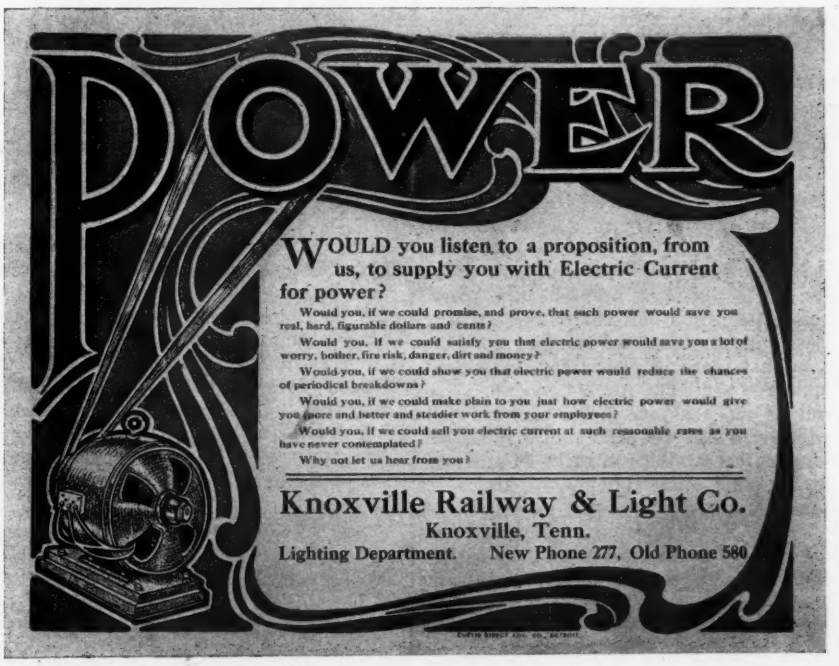
So I say, "If you have the least inclination to mix up with this timid business, get it out of your system at once." When you are talking with a man put your proposition right at him. Hit straight from the shoulder and make him feel that at least you have your guns loaded for a fight, if there's to be one. And nine times out of ten the force of your arguments, together with your earnestness, will convince him when a smiling, lovely manner will make no more impression than bird shot on an elephant.

You've got to hit hard. You've got to be in earnest. You've got to be so determined that it will stick out all over you. Do it.

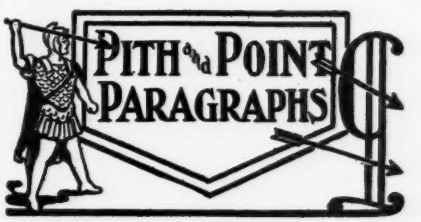
We're expecting big things from you this month. We're expecting to see the largest amount of new business on our books this month we've ever had. Are we to be disappointed? Or are we to have the opportunity of seeing larger commissions, better prospects and greater growth for you?

It all rests with you. What will you do this month?

Illustrations showing the cover and two of the inside pages of an excellent bulletin sent out by the Knoxville Railway and Light Company.


POWER
WOULD you listen to a proposition, from us, to supply you with Electric Current for power?
Would you, if we could promise, and prove, that such power would save you real, hard, figurable dollars and cents?
Would you, if we could satisfy you that electric power would save you a lot of worry, bother, fire risk, danger, dirt and money?
Would you, if we could show you that electric power would reduce the chances of periodical breakdowns?
Would you, if we could make plain to you just how electric power would give you more and better and steadier work from your employees?
Would you, if we could sell you electric current at such reasonable rates as you have never contemplated?
Why not let us hear from you?
Knoxville Railway & Light Co.
Knoxville, Tenn.
Lighting Department. New Phone 277, Old Phone 580

One of the mailing cards sent to prospective users of electric power of the Knoxville Railway and Light Company, Knoxville, Tenn.



Under this heading we shall, from week to week, present to our readers a little series of inspirational aphorisms (original, aboriginal and selected), which will, we believe, prove stimulating and suggestive to those who are interested directly or indirectly in the sale of central station current.

Work's a snap—it's the intermissions that do up the whole nervous system.

The solicitor who thinks he can't do it is always more than half right.

Solicitors who try to make the best of everything generally get the best of everything.

The solicitor who is too good for his job has a job that is too good for him.

Aspiration plus perspiration makes inspiration.

It is better to make a pleasure of business than to make a business of pleasure.

Promptness is the essence of all good business; the lack of it, the cause of most failures.

Some solicitors have their wishbone where their backbone ought to be.

There are two things in this world for

which we are never fully prepared, and that is—twins.

The mule has a reputation because it knows which end of its ability to use.

Half the world makes a living out of the darnfool mistakes the other half makes.

Every man has a perfect right to his opinion, provided it agrees with ours.

Shake yourself up!

Strop yourself for a keen edge.

Make your tongue say what you want it to say, and nothing else.

Healthfulness and Cleanliness
Electric Light THE Light for the Home.
Knoxville Railway & Light Co.
Knoxville, Tenn.
Lighting Department. New Phone 277, Old Phone 380

A strong mailing card, which forms part of the residence service of the Knoxville Railway and Light Company.

The best solicitor is the fellow who never considers himself, but the success of the company all the time.

Conservatism is a good thing—when it is the conservatism which insists on seeing a way out before it goes into a thing.

Force the issue—don't let a lot of weak little considerations stand in the way of a big contract.

Be clear. Be brief. Be pointed. Be careful and thoughtful. And then you've got the backbone of a good contract-getting talk.

Good solicitation is nothing more or less than displaying your proposition so well that every strong point is visible.

It will be our endeavor, from week to week, to present in this department brief notices of activities among the central stations, as gathered from men who are in the field and, consequently, in close touch with the progress of the new-business idea and its acceptance by central station managers. Contributions to this department are solicited, and will be received with much appreciation by the editor.

If you are doing something a little better than or different from the other fellows, and think it would make interesting reading to ELECTRICAL REVIEW readers, send in your schemes and plans. They will be gladly received.

Address all communications to Charles A. Parker, care of the ELECTRICAL REVIEW.

A Suggestion.

The following letter was copied and mailed to the editor of this department, as a suggestion for a letter which central station managers could use on their solicitors. The letter is strongly written and would, no doubt, accomplish its purpose if the solicitor did not take offense. It could easily be made a little more diplomatic, but there are times when blunt sarcasm will accomplish what nothing else will and this was presumably one of the times:

"May 23, 1907.

"TO OUR REPRESENTATIVES:

"Why do we not get more orders for bonds from you men in the field? Are you believing what is told you by competitors and others that there is no business to be had and the only business a bond man has is to either kill time or call on people in a visitational frame of mind?

"Now, if you are in such a state of mind, it explains why orders are not forthcoming. Investors will not place orders for bonds when the proposition is placed before them in a half-hearted sort of way. Base your thought and energies upon the idea that there is money for investment, and that you have just as good bonds to sell as the next one. We have no apologies whatever to make in any respect. If you feel to the contrary, let's get together and either become of the same mind, or know just where we stand.

"Our 'over-the-counter business' has been larger so far this year than for the same period of any other year, but on the contrary, orders from you men have never been so few. Our 'over-the-counter' sales so far this year aggregate ninety-seven per cent of the total sales. In other words, you eight men in the field send in three per cent of sales, and that three per cent of sales costs us nearly fifty per cent of total expenses.

"It is obvious that this condition of affairs is not proper or fair. We recently sent out an offering of bonds, and received orders for over $80,000 of them, of which only $1,000 were sold by you eight men.

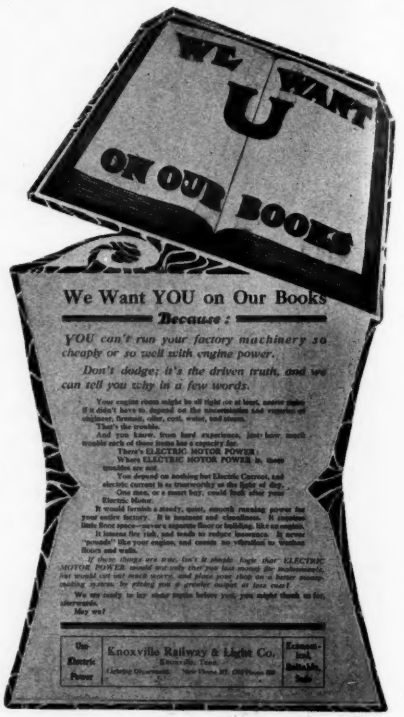
"There is business within your reach. It is up to you to get it. Get on the platform that there are people who want to buy bonds, and that you are going to sell bonds, and you will find that results will follow.

"We have just as attractive and absolutely safe investments as any competitor; therefore, we have a right to expect orders, and not kind words for the future. Kind words are appreciated, but they are not legal tender, neither do they pay expenses.

"It is our desire that you take this communication in the same spirit that it is sent. We wish to point out facts with the hope that you will get in line with orders. We believe that in your minds—to a greater or less extent—there are doubts or other stumbling blocks that prevent you from closing up business. What actual reason have you for such a feeling? None whatever. Cast it off and get down to business—real business—and see what happens. We shall watch with much interest the results of your efforts for the next thirty days.

"Very truly yours,

"_____."


WE WANT U ON OUR BOOKS
We Want YOU on Our Books
Because:
YOU can't run your factory machinery so cheaply or so well with engine power.
Don't dodge; it's the driven truth, and we can tell you why in a few words.
Knoxville Railway & Light Co.

A novelty folder of the Knoxville Railway and Light Company sent to power users.

Knoxville, Tenn.—Among the central stations of the southern states which are actively awake and plying their best efforts to interest and win their people over to the ways of electricity, there is none "harder at it" than the Knoxville Railway and Light Company, of Knoxville, Tenn.

C. H. Harvey, the president and general manager of the company, belongs to the hustle-and-thrive class of business

men, and he is continually on the alert for, and strenuously after, new business.

Mr. Harvey is a man of the Carnegie type—he is not only a hustler himself, but he has the happy knack of inoculating others with the same spirit of activity, and he realizes the importance of surrounding himself with efficient co-workers.

In his selection of Mr. Bundschu, as contract agent, he showed his faculty for selecting the right man for the right place, as Mr. Bundschu took the reins of his office and made things hum from the start.

Both of these men, active in the affairs of the Knoxville Railway and Light Company, are firm believers in the value of advertising for the sale of more juice, and they are liberal users of the best and most profitable methods of advertising that can possibly be used by a central station.

Conditions were somewhat peculiar here. The company was using the right kind of advertising, but unfortunately, on the other hand, it had its hands tied in various ways and was unable to follow up its clever and business-getting advertising with the right kind of personal solicitation to the extent necessary to line up the large amount of business worked up by advertising, and lying ready for the rakes of good solicitors. The company, however, is making amends in this matter, and undoubtedly this year will see a much larger increase.

Each month a well-got-up and attractive bulletin has been sent out which, like most of the bulletins now being sent out by central stations, covers the entire field of usefulness of electricity—that is, it goes on its way among the people of Knoxville, containing something of interest about electric light for the home, office, store, factory or business place. It shows business men the value of the electric sign. It informs the public concerning the many different electrical devices for commercial and household uses. It treats of the superiority of electric power and individual motor equipment. It takes up the latest improvements in everything electrical, and endeavors to make its readers familiar with the practical and every-day uses of electricity.

And it is written in a very interesting, entertaining and convincing manner, well illustrated throughout, and printed in handsome colors on the best of enamel book paper.

The company has also made use of what may be called a special resident advertising service, consisting of attractive mailing cards, folders, booklets, facsimile typewritten letters and novelty folders, to a list of five hundred residents. One piece of advertising is sent to this list each month.

A special service of the same kind of advertising mailed monthly to merchants, spoke in no uncertain terms of the advantages and superiority of electrically lighted stores and show windows.

The whole store service of this company was prepared in the most attractive manner, the different pieces of advertising being so varied in style and type that they were sure to catch and hold the attention of the business man to whom addressed—the thing absolutely necessary to produce results.

For lining up prospective users of electric power, the company had still another advertising service, composed of folders, booklets, mailing cards and personal letters. This service set forth the advantages of electric motors over the "old" methods in such a forceful way that any one using power and of a conservative and economical disposition, would find it a very difficult matter to convince himself that he should not install electric motors.

On the whole the writer believes that the Knoxville Railway and Light Company has carried on an extremely good and sensible advertising campaign.

As one writer put it, "These people believe that if Mahomet will not go to the mountain, the mountain will go to Mahomet." And they have put the block and tackle of intelligent advertising under the mountain and are moving it over against the people's intelligence.

Long Acre Electric Light and Power Company Files Certificate Extending Its Limits.

Announcement has been made from Albany, N. Y., that an amended certificate of incorporation of the Long Acre Electric Light and Power Company, extending the limits of its original charter throughout the boroughs of Manhattan and the Bronx, has been filed with the secretary of state. Along with this information comes the news that John C. Sheehan, one of the controlling interests in the Long Acre company, has made a contract with the United States Independent Telephone Company to connect a proposed telephone service in New York city with the interstate lines of the independent company. It is said that $6,000,000 of the stock of the telephone company has been placed in the hands of five trustees, to be turned over to Mr. Sheehan as soon as his part of the contract has been carried out. These trustees are said to be George Eastman, of the Eastman Kodak Company; H. W. Sibley, W. B. Duffy and J. S. Watson, of Rochester, N. Y., and Herman Steifel, of St. Louis, Mo., representing the interests of Adolphus Busch in the United States Independent Telephone Company.

The original franchise of the Long Acre Electric Light and Power Company gave it the right to do business within the territory bounded by Fifty-ninth street, Fifth avenue, Thirty-third street and the Hudson river. According to the amended certificate filed on June 6, it is empowered to furnish electricity for light, heat and power and other purposes to all of Manhattan and the Bronx. The company has recently bought the old Harlem Hospital site at 120th street and East river, where it is said a plant costing $6,000,000 will be built. In addition to this, according to the statement of Walter H. Knight, chief engineer of the company, the company owns a block on Second avenue, between Forty-seventh and Forty-eighth streets, where it will build a complete electric light plant.

New York Electrical Society.

The annual meeting of the New York Electrical Society for the election of officers was held in Assembly Room No. 2, fifth floor, Engineering Societies Building, 29 West Thirty-ninth street, Monday, June 10, at 8 P. M. The following ticket was elected unanimously:

President, Albert F. Ganz.

Vice-presidents, Augustus Post, Theodore Beran, W. L. Conwell.

Secretary, George H. Guy.

Treasurer, H. A. Sinclair.

After the election Dr. William H. Tolman, director of the American Museum of Safety Devices and Industrial Hygiene, lectured on "Safety and Security for American Life and Labor."

Dr. Tolman reviewed, with illustrations from European and American museums of electrical and other safety devices, and industrial hygiene, what is being done in this important field. A description was given of Port Sunlight, an industrial commonwealth, to show how the conditions of the laborer, in the factory and in the home, can be improved; also of Garden City, an English model, on which three American communities are now being projected; and a sketch was drawn of what is being done in a great American factory. Dr. Tolman also showed a series of views of the International Exposition of Safety Devices and Industrial Hygiene, held in New York this year.

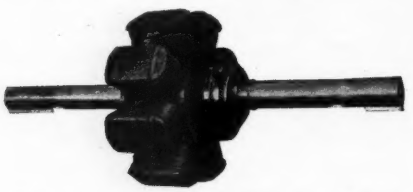
INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Allis-Chalmers Type AB Belted Alternators.

For lighting and power plants in small towns, factories, public and private institutions, office buildings, etc., there is a steady demand for belted alternators of moderate output; and in many cases the first cost of such installations must be kept down to a minimum. The Allis-Chalmers type AB alternators described and illustrated herewith, are especially suited for comparatively small plants where a belted generator not exceeding 150 kilowatts output is required. They are of the revolving field, self-contained type, the two bearings being carried in end housings bolted to the stator yoke, the feet of which rest directly on the slide rails.

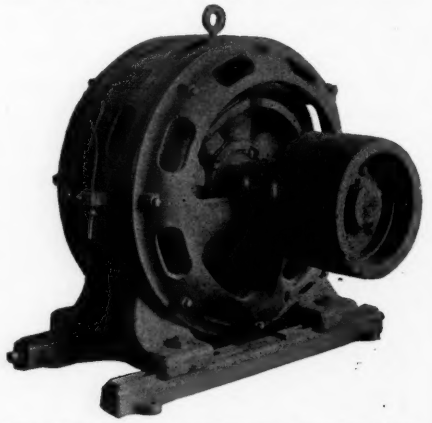
The stator core is built up of steel punchings, the core having ducts at intervals, through which a strong blast of



ROTOR OF SEVENTY-FIVE KILOWATT SELF-CONTAINED ALTERNATOR.

air is forced by the revolving field. The stator core is mounted in a cast-iron yoke provided with numerous ventilating openings and designed to secure ample stiffness. The coils are wound on forms and thoroughly insulated before being placed in the slots, which are open and allow ready removal in case of injury. The coils are held in place by retaining wedges driven into grooves at the tops of the teeth. All windings, after completion, are given a high potential break-down test in accordance with the recommendations of the American Institute of Electrical Engineers. The terminals are of rubber-covered flexible cable brought out through insulating bushings in the stator yoke and provided with insulated connectors.

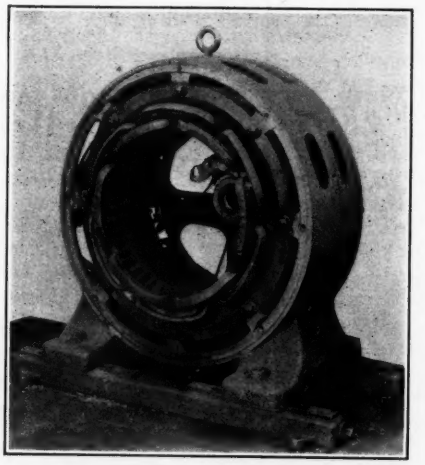
The rotor is provided with a very stiff shaft to which the field spider is keyed. The pole-pieces are built up of punchings securely held together, by rivets, between malleable iron end heads. Each pole-piece carries a magnetizing coil and is attached to the spider by means of a dovetailed projection and tapered steel keys. Field coils are wound with insulated copper wire of square cross section



SELF-CONTAINED ALTERNATOR, SEVENTY-FIVE KILOWATTS, 900 REVOLUTIONS PER MINUTE.

and are designed for excitation at 120 volts. The whole structure of the revolving field is very solid and there is little likelihood of any part getting out of order; the windings are subjected to an insulation break-down test of 1,500 volts between coils and iron.

Exciting current is supplied to the field



STATOR OF SEVENTY-FIVE KILOWATT SELF-CONTAINED ALTERNATOR.

through two cast copper collector rings mounted on the shaft alongside the rotor. The rings have ample wearing depth and are mounted so as to secure thorough insulation. Each ring is provided with two carbon brushes so that one brush can be removed for inspection without interrupting the exciting current. The brush-holder studs are attached to one of the bearing caps.

The bearings are of liberal size and are supported in three-arm housings bolted to the stator yoke. The shape of the housings is such that there is a clear space around the collector rings and brushes, all parts being easily accessible. Bearings are in the form of cast-iron shells lined with babbitt; they are of the self-aligning, self-oiling type, each bearing having two oil rings. The oil reservoirs are large, and an opening provided with a suitable cover, at one side of the bearings, indicates the height of oil. Both bearings on a given machine are of the same dimensions.

These generators are provided with pulley and slide rails; the rails have screws for adjusting the belt tension and the machines are fastened to the rails by bolts.

Type AB alternators are usually furnished with extended shaft to take a pulley for driving a belted exciter; the machines are not arranged for direct-connected exciters.

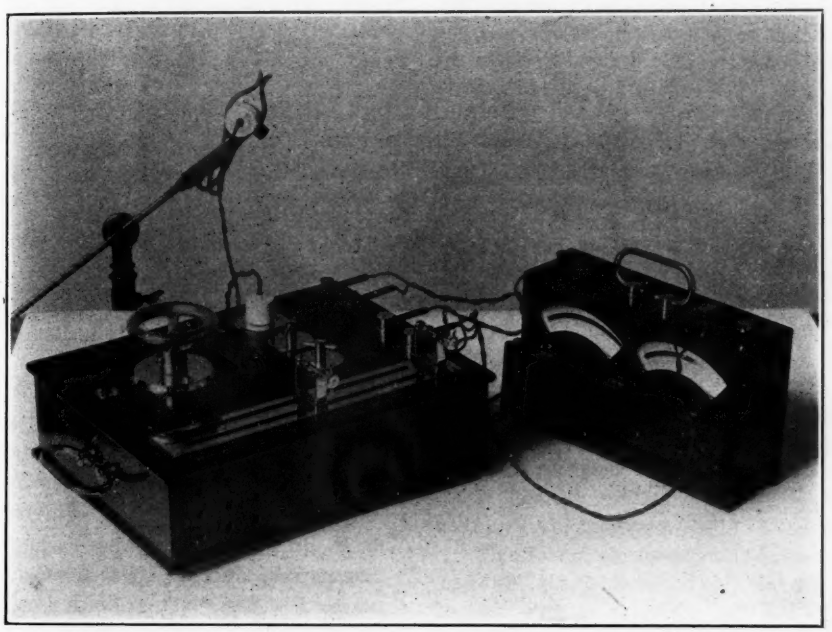
Keystone Direct-Reading Ohmmeter.

The Keystone direct-reading ohmmeter illustrated herewith is designed to measure resistances directly in ohms, with great rapidity and absolute accuracy. The principle of operation is essentially that of the potentiometer and consists in measuring the drop in potential across the terminals of the object whose resistance is to be measured when a current of known value is passing.

The instrument consists of two elements, namely, the regulating box and the indicating instrument. The instrument is the Keystone duplex portable volt-ammeter, and both instrument and regulating box are finished in polished mahogany with nickel-plated and polished trimmings.

The illustration shows an outfit especially designed for the measurement of carbons or other low-resistance objects of considerable area and of variable length and size. The instrument is connected to the regulator box by the leads and binding-posts shown, and connection is made to the testing circuit by means of the receptacle provided. The object to be measured is clamped in the holders shown on the right-

hand side of the regulating box, and the switch on the left-hand side is turned to "on" and the right-hand switch to "volts" in order to determine whether the voltage is normal within the limits provided. This voltage reading is obtained from the upper left-hand scale of the instrument. If the voltage is within normal, resistance measurement may be made by turning the right-hand switch to "ohms" and then regulating the current by means of the rheostat handle until the pointer on the right-hand scale of instrument stands at 1. Then depress the key at the front of the regulating box and read the resistance directly in ohms on the lower left-hand scale of the instrument. If the voltage varies either between or during tests, it is only necessary to keep the current normal at the 1 point by means of the rheostat handle.



KEYSTONE DIRECT-READING OHMMETER.

For the measurement of the resistance of carbons, the ohmmeter is designed for a normal current of 0.1 ampere and covers a range of resistance measurement from 0 to 1.5 ohms in 0.01-ohm divisions. This will enable accurate readings to be made within 0.005 of an ohm.

It is necessary that the testing voltage should be specified, and this may be anything from one cell of storage battery to a power circuit of 500 or 600 volts. The rheostat is designed to maintain the current constant for voltage variations of twenty per cent above or twenty per cent below normal.

This instrument may also be used as a voltmeter and ammeter within the scale limits specified.

The instrument is manufactured by the Keystone Electrical Instrument Company, Philadelphia, Pa.

Union Combination Switch Boxes.

The Chicago Fuse Wire and Manufacturing Company, Chicago, Ill., has recently been granted patents, covering a new line of sheet-steel switch and receptacle boxes, which it has been developing and perfecting the past few years. These boxes are designed for use in connection with concealed wiring of either knob and tube or conduit work, and embody several unique features which commend themselves to the electrical trade for use in old and new installations. The accompanying illustrations show a few of the different types manufactured; and illustrate in a general way the salient features employed in their construction.

Fig. 1 shows the type AA single box and is identical in design with type BB, except that the latter is intended for conduit and armored cable, and is consequently made somewhat deeper, while the box shown in the illustration is provided with five-eighths-inch openings suitable for entrance of flexible tubing. The body of this box forming the back and two end walls, carries the supporting ears, switch lugs, knockout plugs and two side walls, which are attached by means of flanges, formed up so as to come on inside of box, thus presenting smooth edges at all corners, permitting the device to be fitted snugly into a recess in the wall or plaster, just large enough to admit the base without cutting away additional material on account of protruding screw heads or flanges.

The supporting ears of these boxes are swung on a slotted screw pivot, which allows considerable adjustment as well as permitting turning at any angle to secure lodging for supporting screws, or, in new installations, the ears may be inverted, so as to bring the outer face of box flush with the plastered surface. Type AA and type BB unit boxes are made amply large to accommodate all standard receptacles or push-button or rotary switches having rectangular bases, and at the same time leaving sufficient room for entrance of conduit or tubing and wires.

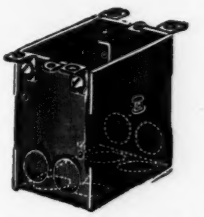


FIG. 1.—TYPE AA SINGLE BOX.

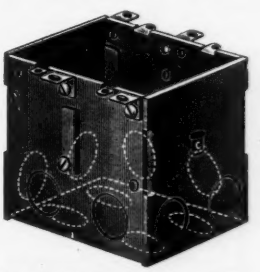


FIG. 2.—TYPE BB GANG BOX.

Fig. 2 illustrates a type BB two-gang box, which is the unit of all sectional gang boxes intended for conduit work. This consists of two boxes very similar to the one shown in Fig. 1 assembled together, the two adjacent side walls being omitted and the flanges secured by screws in place of rivets. This two-gang box is also made in the type AA for knob and tube work where it is desired to install two controlling switches together. If a

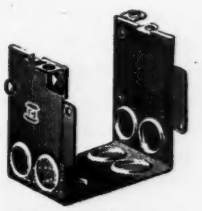


FIG. 3.—SPACER.

gang of switches is to be located in one place, these boxes can be increased indefinitely by removing the screws holding the two portions together and inserting any number of the spacers shown in Fig. 3. In this manner it is possible to meet demands for any gang box from a stock of

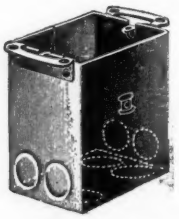


FIG. 4.—TYPE C SINGLE BOX.

two-gang boxes and a few spacers, the only tool required in the operation being a screw-driver. All parts are accurately formed and punched by dies, insuring perfect fitting and ease in assembling, making a close-fitting and reliable box when completed.

In Fig. 4 is shown type C, of different construction, in which the four walls are formed of one piece with a dovetailed joint, thus forming a perfectly smooth outer surface and rounded corners similar to a drawn-steel box. The ears of this device are designed particularly to fit recesses in cover plates of Perkins and H. & H. switches, and are carried in stock from two to six gangs.

Fig. 5 illustrates a four-gang box of this construction. Type C and type D are designed only for installation in old buildings, the latter being constructed identical with type C, but will accommodate any standard make of switch or receptacle. The ears of type C and type D are made with large bearing surface and are well united for installation flush with the plastered surface, and insure substantial support of the device in position. In addition to the above makes a type RC is furnished which is in design similar to

FIG. 5.—TYPE C FOUR-GANG BOX.

AA and BB, but is much shallower and somewhat wider, being particularly designed for rotary switches with round bases.

The Exhibit of the Telephone Manufacturers.

(Continued from page 976)

telephones connected and in operation. Also a combination wire chief and trouble clerk's desk which has just been completed for the Home Telephone Company of Champaign and Urbana, Ill. Another new piece of equipment shown was a duplicate set four-frequency harmonic converter which has been built for the Montana Independent Telephone Company, Butte, Mont., for use in connection with its automatic party lines. Represented by C. L. Fisher, sales manager; F. L. Middleton, assistant sales manager; H. H. Woodworth, advertising manager; J. A. Russell, P. J. Eubanks and J. E. Fisher, of the sales department, and William Hannon and J. S. Engh, of the engineering department.

Universal Pole and Post Preserving Company, Circleville, Ohio, had on exhibition poles treated by the antiseptic method at the ground line. H. R. Folsom, secretary, was in personal charge of the exhibit.

Belden Manufacturing Company, Chicago, Ill., had on exhibition a full line of German silver resistance wire, copper magnet wire, battery tinsel and telephone cords, braided cotton sleeving, rosin cord solder. Exhibition in charge of J. C. Belden, president; Henry J. Landi, engineer; W. B. Parsons, vice-president.

Homer-Roberts Telephone Company, Chicago, Ill., had on exhibition party-line lockout systems. Homer Roberts, president; C. A. Soans, A. F. Rosenberger, manager, in charge of the exhibit.

Indiana Steel and Wire Company, Muncie, Ind., exhibited a full line of telephone wire. E. F. Kitselman, manager; Robert Miller, general sales agent, in charge of the exhibit.

American Electric Fuse Company, Muskegon, Mich., had on exhibition a full line of protective devices. F. G. Jones, president; J. A. Kenny, manager, and G. W. Rodormer, salesman, were in charge of the exhibit.

Western Wire Sales Company, Chicago, Ill., while not exhibiting, was well represented by its vice-president, J. Allen Haines, who did a lot of circulating.

Electric Appliance Company, Chicago, Ill., had on exhibition a full line of switchboards, telephones and telephone apparatus, also the Treco electric whistle. The company was represented by W. W. Low, president; Robert Mitten, manager telephone department; H. N. Remington; M. I. Blakemore, J. L. Arthur, J. K. Alline and M. L. Scobey. The company distributed a handsome watch fob in the form of a shield, the independent shield on the face of it.

The Nungesser Electric Battery Company, Cleveland, Ohio, had on exhibition the "1900" dry battery. Represented by H. G. Robbins, treasurer; H. S. Greene, and Thomas G. Grier, general sales manager.

Western Telephone Manufacturing Company, Chicago, Ill., exhibited a full line of telephone parts, switchboards, both magneto and central energy exchange. The company was represented by Eugene L. Brown, sales manager; C. L. Johnson, treasurer; E. A. Anderson, acting manager, and G. W. Peacock, engineer.

Standard Underground Cable Company, Pittsburg, Pa., while not exhibiting, were represented by J. R. Wiley, J. E. O'Neill, W. M. Rogers, E. J. Pietzcker, Richard Houck, A. A. Anderson and L. L. Parkinson.

Select Telephone Manufacturing Company, Springfield, Ohio, had on exhibition lockout telephones, magneto and central energy, harmonic bells and telephone parts. Represented by C. D. Juvenal, Wm. M. Bruce, Jr., and Charles Ward.

International Electric Meter Company, Chicago, Ill., while not exhibiting, was well represented by its well-known sales manager, J. S. Jackson.

Albert J. Cox, president of the Albert J. Cox & Company, Chicago, was in attendance at the convention.

W. G. Nagel Electric Company, Toledo, Ohio, had on exhibition a full line of telephones. Represented by Harry E. Adams, general sales manager.

United States Coin Register Company, Toledo, Ohio, had on exhibition its combined cash register and pay station. Represented by Gary S. Powell, secretary and manager.

Fibre Conduit Company, Orangeburg, N. Y., had on exhibition its well-known fibre conduit. Represented by W. W. Smythe, Jr., western manager.

American Electrical Novelty Manufacturing Company, New York, N. Y., exhibited Ever-Ready batteries and telephone lamps. Represented by A. E. Barlow, general manager, and P. E. Reiners.

Steel Gain Manufacturing Company,

Chicago, Ill., exhibited its steel gain. Represented by Frank M. McDonald.

Monarch Telephone Manufacturing Company, Chicago, Ill., exhibited a full line of switchboards, telephones and equipments; also central energy switchboards. Represented by J. E. Norling, president; E. E. Axley, treasurer and general manager; W. H. Trimm, secretary; A. J. Carter, R. C. Stone, T. L. Dunlap and W. A. Fricke, engineer.

United Clock Company, Chicago, Ill., exhibited its self-winding clock for use in telephone exchanges or offices. Represented by E. E. Axley, treasurer; Albert Turk, president; Alexa T. Bagley, vice-president, and R. W. Trimm, secretary.

Protective Electrical Supply Company, Fort Wayne, Ind., exhibited its protective can top cable terminals. Represented by M. B. Lorimer, president, and F. X. Staub, treasurer.

Carnahan-Sherwood Company, Indianapolis, Ind., exhibited an accounting system. Represented by C. M. Glover and H. E. North.

Dean Electric Company, Elyria, Ohio, while not exhibiting, put at the disposal of the delegates a very comfortable smoking and rest room. Represented by W. W. Dean, vice-president; A. E. Barker, secretary; George E. Scoville, sales engineer; E. M. Ford, A. B. Smith, W. C. Scott and L. G. Bowman.

Crawfordsville Wire and Nail Company, Crawfordsville, Ind., exhibited telephone wire and strand. Represented by H. E. Cobb, sales agent.

Scranton Button Company, Scranton, Pa., exhibited telephone push-buttons, receivers and mouthpieces. Represented by H. E. Cobb, sales agent.

Alfred F. Moore, Philadelphia, Pa., exhibited magnet telephone wire, receiver cords and switchboard cords. Represented by H. E. Cobb, sales agent.

Acme Rubber Manufacturing Company, Trenton, N. J., exhibited rubber-covered wire and cables, and inside telephone wire. Represented by H. E. Cobb, sales manager.

Minnesota Electric Company, Minneapolis, Minn., exhibited Chapman lightning arresters. Represented by H. E. Cobb, sales manager.

International Telephone Manufacturing Company, Chicago, Ill., exhibited a full line of telephones, switchboards and equipments. H. Schaeffer, president; Fred E. Freers, sales manager; W. R. Shaw and J. Hoffenkamp, representatives.

Swedish-American Telephone Company, Chicago, Ill., exhibited a full line of telephones, switchboards and equipments. Represented by E. V. Overshiner, president; A. V. Overshiner, secretary and general manager; C. L. Ward, F. M. Ferguson, S. A. Duvall and A. D. Fox.

North Electric Company, Cleveland, Ohio, exhibited a full line of telephones, switchboards and equipments. C. H. North, president; J. F. Engle, sales manager; A. A. Marr, A. A. Miller, C. D. Boyd, G. B. Pratt and R. Hendricksen were in attendance at the exhibit.

F. Bissell Company, Toledo, Ohio, while not exhibiting, was ably represented by its president, F. Bissell, C. M. Hamilton, secretary; J. A. Navarsee, Walter Bissell and Murray Townsend.

National Carbon Company, Cleveland, Ohio, exhibited Columbia dry batteries. Represented by E. J. Kenny, M. H. Moffet, A. V. Ward and Wallace O'Connor.

Eureka Electric Company, Geneva, Ill., exhibited a full line of telephone switchboards and equipments. Represented by V. H. Messenger, secretary and treasurer; J. H. Bell, G. H. Miller, general sales manager, and E. L. Larrabee, western representative.

United Brass Manufacturing Company, Cleveland, Ohio, exhibited a practical demonstration of the wire-joint machine for splicing cables. Represented by W. J. Schonberger, manager, and T. V. Daley.

Julius Andrae & Sons Company, Milwaukee, Wis., exhibited a full line of telephone switchboards and equipments. Represented by W. S. Pearne, advertising manager; J. C. Schmidtbauer, vice-president, and F. T. Andrae, secretary.

Everstick Anchor Company, St. Louis, Mo., exhibited "Everstick" anchors. Represented by Jasper Blackburn, president and manager.

Century Telephone Construction Company, Buffalo, N. Y., exhibited a full line of telephones, switchboards and equipments. Represented by C. H. Macklin, sales manager; W. W. Kidney, engineer; G. F. C. Bauer, sales department, and F. O. Rhode, manager Kansas City branch

Duplex Metal Company, New York, N. Y. Represented by B. L. Eldred, treasurer and secretary.

Central Telephone and Electric Company, St. Louis, Mo., exhibited a full line of telephones and equipments. Represented by James S. Cuming, president; C. H. Wallis, vice-president; L. G. Le Bourveau, sales manager.

American Steel and Wire Company, Chicago, Ill., exhibited all kinds of insulated and bare steel and copper telephone wires. Represented by C. S. Knight, western manager; Frank Conklin, George Quigley, Kansas City, and B. B. Ayres, advertising manager.

Chicago Telephone Supply Company, Elkhart, Ind., represented by George A. Briggs, president; George W. Brown, secretary-treasurer; F. P. Mackintosh, chief engineer; J. Edward Myers, manager Dayton branch; D. F. Roseborough, western representative.

Sterling Electric Company, Lafayette, Ind., had a very attractive exhibit in the writing room. The company was represented by W. E. Doolittle, president; W. R. Coffroth, secretary; S. B. Fowler, electrical engineer; Evan Shelby, sales manager; H. T. Doolittle, purchasing agent; C. R. Brown and O. P. Reed, sales engineers. The company distributed an attractive souvenir programme.

Kellogg Switchboard and Supply Company, Chicago, Ill., while not exhibiting, put at the service of the delegates automobiles which were running continually from the Auditorium to its plant. A great many delegates took advantage and were carefully shown through this company's large works. Represented by J. C. Lewis, Chicago sales manager; C. M. Thompson, Philadelphia office; R. F. Mueller, Cleveland office; R. W. Tillard, Cleveland office; E. C. Lawrence, Ohio representative; W. R. Hind, Iowa representative; J. M. McGee, Missouri representative; A. C. Bowe, Minnesota representative; J. C. Murray, Indiana representative; Chester E. Roberts, Illinois representative; W. L. Harris, Kansas City representative, and F. T. Schaffer, North Dakota representative.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., and Chicago, Ill., exhibited a full line of the latest style of telephone and switchboard equipments, together with cable and construction material. Represented by A. M. Haubrich, Chicago manager; S. W. Manefee, William Bowen, Paul D. Myers, E. P. Schafer, Carl Schafer, sales department, Rochester, N. Y.; J. P. Cracraft, sales manager, Rochester, N. Y.; H. C. Slemin, advertising manager, Rochester, N. Y.; E. C. Lewis, Ben C. Hyde, J. J. Nate, J. B. Wilkinson, H. A. Jones, of Pennsylvania; F. G. Hudson, D. C. Gould and Charles Speed.

S. B. Condit, Jr., & Company, Boston, Mass., while not exhibiting, was represented by its able western manager, Philip R. Fisher. Mr. Fisher was expounding the merits of the Marlin cable hangers.

Peirce Specialty Company, Elkhart, Ind., while not exhibiting, was well represented by its president, C. L. Peirce, Jr.

American Electric Telephone Company exhibited a full line of telephone switchboard equipments. Represented by P. C. Burns, president; J. G. Ihmsen, secretary and general manager; M. W. Zabel, general sales agent.

McRoy Clay Works, Chicago, Ill., exhibited McRoy clay conduits, E. F. Kirkpatrick, Chicago manager, in charge of the exhibit.

Chicago Insulated Wire Company, while not exhibiting, was represented at the convention by T. C. Turlay, president, and William M. Smith, secretary and treasurer.

Haeusermann Metal Manufacturing Company, Chicago, Ill., while not exhibiting, was well represented by its western representative, Harry A. Ford.

Vulcan Electric Heating Company, Chicago, Ill., exhibited the celebrated Vulcan heating irons. Represented by L. P. Brown, vice-president.

George Cutter Company, South Bend, Ind., while not exhibiting, was represented by President George Cutter.

Central Electric Company, Chicago, Ill., while not exhibiting, was represented by F. R. Bryant, R. L. Kimble, Louis Privat and J. A. Savage.

Blake Signal and Manufacturing Company, Boston, Mass., was represented by Syles R. Fralick, who was expounding the merits of the Blake Tube Flux.

The Illinois Electric Company, Chicago, Ill., was well represented by E. A. Quarfot, C. J. Litcher, C. C. Dawson, Cameron McIntyre, Dewey Newman and F. D. Rusling.

Current Electrical News

DOMESTIC AND EXPORT.

MANITOBA TO TAKE OVER TELEPHONE SYSTEMS—The provincial government of Manitoba is said to be making arrangements to buy out the systems of the Bell Telephone Company in some of the larger cities and towns of the province, notably the systems in Winnipeg and Brandon, retaining the long-distance lines in the province under a working arrangement with the government.

BALTIMORE ELECTRIC COMPANY TO INCREASE CAPITAL—A special meeting of the stockholders of the Baltimore Electric Company, Baltimore, Md., has been called for June 28 to vote on a proposition to increase the capital stock from $3,400,000, divided into 68,000 shares of the par value of $50 each, to $3,750,000, divided into 75,000 shares of the same par value, of which number 50,000 shares are to be common stock and the remainder preferred stock. The Baltimore Electric Company was formed recently by the consolidation of the Maryland Telephone and Telegraph and Baltimore Electric Power companies.

ELECTRIC ROAD GRANTED AUTHORITY TO ISSUE MORTGAGE—The New York state railroad commission has consented to the issuance of a mortgage of $2,000,000 by the Canandaigua Southern Electric Railroad Company, which was recently granted authority to build an electric street surface railroad between Canandaigua, Ontario county, and Atlanta, Steuben county. In its petition for the authorization of the mortgage the company sets forth that it has filed certificates of extension to build from Atlanta to Wayland, Steuben county; from Atlanta to Lake Salybria, southeast of Bath, Steuben county, and from Canandaigua to Palmyra.

HARWOOD ELECTRIC POWER COMPANY TO BUILD LARGE POWER-HOUSE—The Harwood Electric Power Company, chartered by the Pardee interests of Hazelton, Pa., has filed notice of a proposed bond issue of $2,000,000 for the extension of its business. For the present only about one-fourth of the loan will be utilized. It will be for the purpose of erecting a power-house at Harwood, to take the place of the temporary plant, built so that the franchise in Hazelton could be held under the terms of an agreement with that city to furnish light by March 1. This plant now supplies all the light and power handled by the Consumers' Electric Light and Power Company, of Hazelton, a subsidiary corporation.

CENTRAL COLORADO POWER COMPANY FILES MORTGAGE—There has been filed at Colorado Springs, Col., a $20,000,000 mortgage given by the Central Colorado Power Company to the Knickerbocker Trust Company, of New York. The larger projects covered by the mortgage are the DeRemer canal and pipe-line, known as the Shoshone water power enterprise, near Glenwood Springs; the Grand River Power and Transmission Company, located above Glenwood Springs; the Hine reservoir, located on the Williams fork of the Grand river in Grand county with a capacity of 3,000,000,000 cubic feet; Hine reservoir No. 2, also in Grand county below Grand Lake, capacity 10,000,000,000 cubic feet; Aspen reservoir No. 1, in Pitkin county, capacity 43,000,000,000 cubic feet; New Century reservoir known as the Gore cañon project, with a capacity of 7,000,000,000 cubic feet.

ADVERSE DECISION IN CLEVELAND THREE-CENT FARE CASE—The Ohio Supreme Court in the suit of the city of Cleveland against William Reynolds has decided in favor of the Cleveland Consolidated Railways Company and against low fares. The case involved the validity of the street-car franchises on Erie and Central avenues, Cleveland. The Circuit Court upheld the validity of the franchises of the Consolidated Railways Company and the Supreme Court sustained the Circuit Court. The decision is a blow at Mayor Tom L. Johnson and his campaign for low fares for Cleveland. Mayor Johnson fought the renewal of the franchises and proceeded to give franchises through the council to others. This was resisted by the Consolidated company and the matter was taken to the courts for settlement.

HYDROELECTRIC POWER IN MEXICO—The Mexican government has granted the application of the Batopilas Mining Company for a concession to install a hydroelectric plant at Los Algodones on the Batopilas river. A transmission line will be built from the plant to the mines and smelter at Batopilas. The Compania Hidro-Electrica San Augustin, recently organized at Puebla, Mexico, with a capital stock of $1,000,000, will install a hydroelectric plant and furnish the city of Puebla with light and power. Fernando Pimentel y Fagoaga is president of the company. It is announced that the Compania de Tranvias, Luz y Fuerza, of Guadalajara, will build a transmission line from Guadalajara to Aguascalientes, about 125 miles. It will dispose of about 5,000 horse-power in that city. The company has a capital stock of $11,000,000. Andres Bermejillo, of Mexico City, has been elected president of the company.

STREET RAILWAY SYSTEM FOR BAHIA—It has recently become known that New York interests, said to be allied with the Havana, Mexico City, Rio de Janeiro and other West Indian, Central and South American electric traction and lighting properties, have completed financial arrangements in Europe for the construction and operation of street railways in Bahia, Brazil. A lighting monopoly has been taken over and extensive water power rights have also been acquired. The development of the Bahia projects will entail an expenditure of nearly $10,000,000. The Bahia Tramway, Light and Power Company will carry out the work. It has been incorporated under the laws of Maine, with a capital of $3,500,000 in common stock. There are also authorized $7,500,000 of five per cent fifty-year first mortgage bonds. An issue of $3,500,000 of these bonds has just been made in the London and Brussels markets. The New Yorkers interested in the company include Percival Farquhar, William Lanman Bull and F. S. Pearson.

CAPITOL TRACTION COMPANY GIVES LARGE MORTGAGE—To secure an authorized issue of $6,000,000 in bonds dated June 1, 1907, and maturing June 1, 1947, the Capitol Traction Company, Washington, D. C., has placed on record a deed of trust to the Union Trust Company upon the street-car property. The issue is to be known as forty-year five per cent gold coupon bonds and is made under the provision of an act of Congress of March 3, 1891, in which it was provided that bonds might be issued by the company not to exceed half its capital stock of $12,000,000. The money is needed for construction in addition to that undertaken in 1900, for which $1,500,000 in bonds were issued, the proceeds of which have been spent. Twelve thousand bonds are authorized by the deed of trust in denominations of $500 each. The property pledged for the repayment of the $6,000,000 includes the power-house, car barns and all the holdings of the company in the District, including its corporate rights and franchises.

LACLEDE POWER COMPANY SOLD—E. W. Clark & Company, of Philadelphia, Pa., has acquired the Laclede Power Company, the only independent light and power company in St. Louis, Mo. The company was owned by St. Louis capitalists and business men. With the purchasing of this company by Clark & Company, following the purchase of the St. Louis & Suburban Railway System by the North American Company, all the lighting and street railway companies of St. Louis have passed from the control of St. Louis financial interests. The Laclede Power Company was sold for $3,000,000. Clark & Company bought the property about a year ago and made an initial payment of $500,000, giving notes for the balance. These were paid on June 1. The company is capitalized at $1,000,000, and during its existence it has never issued bonds or notes. The company controlled the Edison Electric Illuminating Company, of Carondelet, which also passes to Clark & Company.

The proprietary company is only a contracting company, and has no right to operate on the streets. The franchise is held by the Edison Electric Illuminating Company. The principal stockholders in the Laclede Power Company are Henry C. Scott, S. W. Fordyce, J. C. Van Blarcom, S. M. Dodd, Thomas H. West, the Tutt estate and E. V. Matlack. The present officers are still in charge of the company, and it is not known what arrangements Clark & Company have made or will make for managing the property.

CANADIAN GOVERNMENT CLOSES CONTRACT FOR NIAGARA POWER—The contract between the Niagara Power Union, representing the municipalities of western Ontario, and the Ontario Power Company, of Niagara Falls, Ontario, for a supply of electricity for the seventeen municipalities, has been closed by the government and the local company will furnish the power at $10.40 per horse-power, 35,000 horse-power being the amount to be generated. The government is to erect the transmission lines and step down the power and the municipalities are to distribute it in their respective cities and towns. The project is said to be the beginning of a comprehensive scheme which Adam Beck and other advocates of government control of Niagara power are planning to carry out. It is intended that ultimately the government shall control the power product of the falls and send the electric energy to all parts of the province. To curb the commercialism which might tend to impair the scenic value of the falls, the government is energetically restricting the generation of power. The three companies which now have charters to utilize the falls are restricted to respectively 125,000 horse-power, 180,000 horse-power and 100,000 horse-power. It is provided that the municipalities may contract with the government for any amount of power and may consume as much above that limit as the actual demand necessitates. Seventeen municipalities in all are included in the proposed circuit, which covers all of the more prominent cities, including Toronto, Hamilton, London, Brantford, Stratford, Guelph and others.

CHICAGO TELEPHONE ORDINANCE—The ordinance which has been drafted by the city council of Chicago, Ill., extending the franchise of the Chicago Telephone Company twenty years, contains provisions providing that the company's books shall be opened to city inspection at any time; the city to be paid three per cent of gross receipts in Chicago; to have free telephone service in the City Hall and a discount of twenty-five per cent on all other city business. The maximum rates are fixed throughout the city limits: business lines $15 per quarter, with a maximum of 300 calls; and the rates at all private exchanges will be substantially reduced. Trunk line charges are reduced from $36 to $24 per annum, and where messages are contracted for in advance there will be no charge for trunk lines. It will be possible under the new ordinance to obtain business calls at 2.8 cents each. Residence rates will be greatly reduced, and public telephone calls will be fixed at five cents. The city reserves the right to regulate any of the rates of the company at periods of five years, and further provides that if the telephone company shall make net earnings in excess of ten per cent on the money actually invested in the plant, such excess earnings shall be paid to the city. The company must also set aside not less than four per cent, nor more than eight per cent, upon the amount invested for a depreciation fund. The city may purchase the plant if it so desires in 1919, or in 1924, or at the termination of the ordinance, paying the cost of duplication less depreciation, with five per cent in addition as compensation for the compulsory sale, without taking into account earning power or value of franchises.

ENGINEERING SOCIETY NOTE.

CORNELL UNIVERSITY BRANCH, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—The closing meeting of the Cornell University branch of the American Institute of Electrical Engineers was held on June 4, at Ithaca, N. Y., when a new constitution and by-laws were discussed. A paper was delivered by Professor Ernest Morritt, on "Radioactivity," which elicited a good deal of interesting discussion. This meeting closed a very successful year for the Cornell branch.

ELECTRIC LIGHTING.

HENDERSON, TENN.—The village has voted to own and operate its electric light plant.

MT. JOY, PA.—Quarryville is to be lighted by electric current transmitted from Strasburg.

CLEVELAND, OHIO—Fire did over $500 worth of damage to the Lakewood lighting plant on May 16.

OZARK, ARK.—It is expected to have an electric light plant in Ozark within the next three months.

BRAZIL, IND.—The Brazil Electric Company's plant was damaged to the extent of $10,000 by a boiler explosion on May 22.

CLAY CITY, IND.—The boiler in the Clay City electric light plant exploded on May 21, wrecking the system. The loss is estimated at $10,000.

LA CROSSE, WIS.—The common council has rejected the proposition of the Wisconsin Light and Power Company offering its plant to the city for $400,000.

WAPPINGERS FALLS, N. Y.—At a special election in Wappingers Falls it was voted to bond the village for $10,000 to duplicate the electric light system.

RISING SUN, MD.—The installation of a hydroelectric plant at McKinsey's mill, Principio, has been commenced. The power will be used to light Rising Sun.

MONTGOMERY, ALA.—A company has been organized to harness the water power of Short creek in Marshall county and operate with it an electric railroad from Gadsden to Scottsboro.

FITCHBURG, MASS.—Henry Allison and Andrew Whitney, of this city, have purchased the Greene Electric Light Company's plant at Ashburnham. The price paid for the plant is not given.

HOUSTON, TEX.—The Houston Light and Power Company, which owns the electric lighting plant, will spend half a million dollars during the next few months. Work will be started shortly.

ARLINGTON, OHIO—The council at Arlington, Hancock county, has accepted the plans for the construction of a municipal electric lighting plant. George Champe, of Toledo, will supervise the work.

WESTERLY, R. I.—The act incorporating the Mystic Power Company has been passed by the legislature. Mystic is now to have a day and night service, as soon as the line can be built to Westerly.

PHILADELPHIA, PA.—Herbert E. Havens has plans for estimates on additions to the power plant of the Shamokin & Coal Township Light and Power Company, planned by Janney & Darlington.

WILMINGTON, DEL.—An amendment to the charter of the Commercial Heat, Light and Power Company has been filed at Dover by which the authorized capital stock of the concern is increased from $100,000 to $1,000,000.

ALTURAS, CAL.—The Alturas Electric Light and Power Company is arranging to install a larger water-wheel than the one at present in use and also to make a number of other enlargements to meet the increasing demand for current.

INDIANAPOLIS, IND.—The state board of agriculture has voted to erect a waterworks, electric light and heating plant at the state fair grounds. The plant is to cost $10,000, and will be completed in time for the next state fair. Work has been begun.

STANBERRY, MO.—The Stanberry electric light plant has been sold under a deed of trust, Frank Jones being the trustee. There were two bids made, one by R. P. Duncan of $17,000, the other by John A. Showen of $18,000. Mr. Showen will operate the plant.

PONTIAC, MICH.—The contract for street lighting has been turned over to the Pontiac Light Company. The Pontiac Standard Lighting Company, which has been the cause of litigation lasting for three years, has disposed of its interests to the former concern.

JOHNSON, VT.—Parker & Stearns has leased to the village the right to take water from its dam at its sawmill privilege in Johnson, Vt., for the term of ninety-nine years, for the purpose of supplying the village with power for lighting and other purposes. The

village is to pay $2,500, and not use water to generate more than 150 horse-power during the day run. The village is to build the dam and flume and keep the same in good condition.

UNIVERSITY PLACE, NEB.—The city of University Place has called a special election for the voting of $15,000 bonds for the construction of a new electric lighting system. The work of designing the system is in the hands of Baker & Early, Lincoln, Neb., consulting engineers. Construction work will begin immediately after the sale of the bonds.

APPLETON, WIS.—The Green Bay & Mississippi Canal Company of this city has awarded the contract for a $75,000 electric power-house to the engineering firm of O'Keefe & Orbison. It is the intention of the canal company to furnish electrical power for manufacturing industries in practically every city of the Fox river valley and ultimately extend its service to Milwaukee.

EUGENE, ORE.—B. F. Howard, owner of the Junction City electric light plant, has filed with the county clerk notice of appropriation of the waters of Bear creek, a stream west of Junction, for the purpose of generating power for the operation of an electric light plant. The site of the proposed canal and power plant is about two miles east of Goldson and eight miles southwest of Junction.

BERKELEY, CAL.—The Berkeley Electric Lighting Company, a branch of the Oakland Gas, Light and Heat Company, has announced extensive improvements soon to be made in Berkeley, including the erection of a $150,000 electric substation; the removal of the high-voltage power lines from Grove street and the substitution in Shattuck avenue of underground conduits in place of aerial cables now used.

WILMINGTON, N. C.—The board of aldermen has granted permission to the Tide-water Power Company, a subsidiary corporation of the firm of Hugh Mackay & Company, to bring its transmission lines into the city from the plant of the Rockingham Power Company, near Rockingham, at Bluitt's Falls. It is proposed to transmit from the Rockingham plant a sufficient amount of electricity for the private and public lighting of the city of Wilmington and also for power purposes.

WASHINGTON, GA.—The Hopewell Electric and Manufacturing Company has been incorporated with $40,000 capital stock to acquire and develop water power near Washington. The company is headed by James A. Benson, T. Burwell Green and Henry O. Riley, though many others are named among the incorporators. It will at once begin the construction of a plant for the generation of electricity for heat, light and power, which will be used throughout this immediate section, mainly in Washington.

DENVER, COLO.—All the directors of the Denver Gas and Electric Company who have served during the past year were re-elected at the annual meeting of the stockholders. In the absence of President Henry L. Doherty, Frank W. Frueauff presided. The directors elected are: Philip Cross, Frank W. Frueauff, Emerson McMillin, Henry L. Doherty, James B. Grant, John C. Mitchell, Fred G. Moffat, Harry C. James, Henry T. Rogers, George W. Wood, Edward W. Rollins, William J. Barker, R. B. Sullivan.

CHICO, CAL.—The Valley Counties Power Company has under construction an eight-mile ditch between Nimshew and Centerville, Butte county. This ditch, which is to carry water from Butte creek at the De Sabla power plant, near Nimshew, eight miles along Butte creek to the power-house at Centerville, is to be five and one-half feet deep, and eighteen feet wide, and will, when completed, increase the capacity of the Centerville plant from 1,000 to 7,000 horse-power. It will have a carrying capacity of 6,000 inches.

ATLANTA, GA.—The bid of the Georgia Railway and Electric Company for the city's electric lights for five years has been accepted by the council committee. At present the city is paying $75 each for arc lights and $33.75 each for incandescent lights. Under the new scale the saving to the city for five years will be about $105,260. Private consumers will not be charged for commercial or private purposes more than ten cents per kilowatt-hour for light and six cents per kilowatt-hour for power.

JACKSONVILLE, FLA.—The Fore River Shipbuilding Company, general contractor for the Atlanta, Birmingham & Atlantic Railway, has let a contract to the Florida Electric Company, of Jacksonville, to erect an electric light plant at Brunswick, to be used in connection with the terminals at that place. The plant, which will be a 150-kilowatt generating plant, will cost $25,000, with specifications for 177 arc lights and 1,000 incandescent lights. The lights are to be used on the site of the terminals, in the warehouses, on the piers and in the different plants.

WINDSOR, VT.—At a meeting of the grantees under the charter of the Claremont Power Company, an organization was effected by electing the following directors: W. L. Mauran and Thomas E. Steere, of Providence, R. I.; Hira R. Beckwith, L. N. Wheelock, Frank H. Foster, of Clarement. It was decided to capitalize the company at $700,000, $600,000 common stock and $100,000 preferred. The directors organized as follows: president, W. L. Mauran; vice-president, Hira R. Beckwith; treasurer, Thos. E. Steere; general manager, L. N. Wheelock.

MENOMINEE, MICH.—C. O. Johnson, of Oshkosh, manager of the Hydro-Electric Water Power Company, is perfecting a plan to establish a power plant on the Peshtigo river and to obtain a franchise from this city and Marinette to construct an interurban line through Menominee and Marinette counties. The company is composed of some of the best-known capitalists of Oshkosh, Marinette and Menominee, with a capital of $2,000,000 to develop the contemplated improvements. Power will be transmitted to Green Bay, Appleton, Neenah, Menasha and Oshkosh.

ATLANTA, GA.—The Anthony Shoals Power Company, incorporated with large capital to develop Anthony Shoals on Broad river in Georgia, has met with difficulties in its work, as the Hapeville Tank Company, at the side of the shoals, has passed into the possession of another company which proposes to compete. The former has spent about $250,000 in surveys and purchasing land, and the latter spent a large sum. Another difficulty is the proposed Bells Ferry bridge, to be built by Elbert county. It is claimed that if the company builds its dam the water will completely inundate the bridge.

GREENFIELD, MASS.—Work has been begun on the construction of a dam and power plant at Cavendish gorge on Black river in the town of Cavendish, Vt. The Claremont Power Company, capitalized at $700,000, is behind the enterprise, and it is expected that by December 1 more than 2,000 electrical horse-power will be available for manufacturing purposes. The dam will be of reinforced concrete, fifty-five feet high and 160 feet long, and steel penstocks will convey the water to turbines 1,200 feet below the dam. The fall is 124 feet. The wire carrying the current will run across country to Claremont, a distance of twenty miles.

LA CROSSE, WIS.—The La Crosse Water Power Company, the $5,000,000 corporation which will furnish electric power from a plant at Hatfield, expects to have the work completed so that power may be furnished La Crosse and Winona by December 1. The contract for the electrical apparatus has been awarded to the General Electric Company, of Schenectady, N. Y. The contract includes two 4,000-horse-power generators and two 250-horse-power wheels for the exciter in the power-house. These will be driven by a 4,000-horse-power water-wheel, which will be furnished by the S. Morgan Smith Company, of York, Pa. The electrical contract includes the transformers for the substations to be located at La Crosse and Winona, with all necessary lightning arresters and high-tension switches.

TROY, N. Y.—The McCaffrey Water Motor and Power Company held its annual meeting on May 15. The following directors were elected to serve during the ensuing year: Joseph G. McCaffrey, L. C. McBride, Detroit, Mich.; F. T. Schmidt, Detroit; W. S. Wagar, L. E. Wagar, W. W. Winchester, Frank E. O'Brien, D. J. Murnane, W. J. Reynolds, William J. Hough, Albany; Frederick A. Tyler, Albany; John T. Norton and Samuel E. Hutton, Troy. Immediately after the adjournment of the stockholders' meeting the board of directors convened and elected the following officers: president, Joseph G. McCaffrey; first vice-president, Francis T. Schmidt, of Detroit; second vice-president, W. W. Winchester; secretary, L. C. McBride, Detroit; assistant secretary, Samuel E. Hutton; treasurer, Frank E. O'Brien. It is the intention of the company to complete the power plant at Barberville as soon as possible. From the present outlook it is thought that power will be produced in three months.

ELECTRIC RAILWAYS.

ROSEBURG, ORE.—One hundred thousand dollars has been raised for the Roseburg-Coos Bay Railroad.

DENVER, COL.—The Denver City Tramway Company has laid over ten miles of new track since March 6.

BENTON HARBOR, MICH.—The interurban line from Benton Harbor to Eau Claire, fifteen miles, has been completed.

NEW HAVEN, CT.—The Consolidated Railways Company has placed with the Wason Manufacturing Company an order for about 150 new trolley cars.

FINDLAY, OHIO—The work of grading for the new electric line to run from Findlay to Marion, fifty-one miles, has been begun at Marseilles. Bonds have been negotiated.

DOYLESTOWN, PA.—The Doylestown & Easton trolley road has been sold at foreclosure to J. Carroll Williams, of Philadelphia, for $100,000. The purchaser represented bondholders.

BRIDGEPORT, CT.—Vice-President Calvert Townley, of the Consolidated Railway Company, states that $600,000 will be spent by the company in improving the Bridgeport division next year.

BROOKLYN, N. Y.—The board of aldermen has taken favorable action on the proposition of building elevated trolley approaches at the Brooklyn terminal of the Brooklyn Bridge. The improvement will cost $150,000.

KANSAS CITY, MO.—The ownership of the Marlborough electric line has been transferred to the Kansas City & Westport Belt Railway, a company subsidiary to the Metropolitan Street Railway Company. The price named was $100,000.

BRISTOL, TENN.—The Bristol Belt Line Railway Company has been granted a franchise to construct a system in Bristol, Va. The company proposes to construct and have in operation within six months several miles of additional track.

SPRINGFIELD, MASS.—The Springfield & Eastern Street Railway Company, a New Haven property, has petitioned the railroad commissioners of Massachusetts for authority to issue $750,000 additional capital stock for an extension to Fiskdale.

WAYCROSS, GA.—The city council of Waycross has granted a franchise to Burdette Loomis, of Hartford, Ct.; George W. Deen, of Waycross, and Frank H. Elmore, of Jacksonville, Fla., to construct and operate a street-car system in Waycross.

GRAFTON, W. VA.—The contract for building the Grafton street railway has been awarded to Tolbert Brothers, of Fairmont, W. Va. The line will be two and one-half miles in length, but extensions will probably be made as soon as this portion is completed.

ATHENS, PA.—The charter for the proposed electric line to Lake Winola has been granted. The road will be about eight miles long and will connect Clarks Summit with Lake Winola. The company is capitalized at $48,999, and the directors are Scranton and Peckville men.

MACKINAW, ILL.—Work has been begun on the Mackinaw-Lincoln line of the Illinois Traction System. The Crescent Construction Company, of Peoria, is the sub-contractor for the work, having been employed by Tuttle Brothers, of Decatur, to complete the grading at the junction of the Peoria-Bloomington line.

ALLENTOWN, PA.—Col. H. C. Trexler has resigned as president of the Lehigh Valley Transit Company, and E. M. Young as vice-president. David Young, of Newark, was elected president *pro tem.* until the annual meeting is held next January and Warren S. Hall was made vice-president and general manager.

SEATTLE, WASH.—Plans for the Shoreline Electric Railway, the interurban road for which the city council granted M. J. Wightman and C. J. Muckler a franchise over certain streets, have been filed. To maintain their franchise the two promoters must deposit with the city by July 1, $10,000.

SCRANTON, PA.—A new trolley road, which will extend from Montrose to Wyalusing, has been projected. It will be known as the Wyalusing Valley Railway. Application has already been made for a charter. The men interested are all attorneys, as follows: W. D. B. Ainey, T. J. Davis, M. S. Allen and J. S. Courtright.

ALBANY, N. Y.—At special meetings held at Albany of the United Traction Company and the Hudson Valley Railway, L. F. Loree was elected president. Mr. Loree was also elected president of the Champlain Transportation Company. In each of the three companies C. S. Sims was chosen to succeed A. I. Culver as vice-president.

GREENCASTLE, IND.—According to information received here eastern capitalists are considering the building of an "educational interurban route" connecting the college cities of Lafayette, Crawfordsville, Greencastle and Bloomington. The interurban would be a paying investment in the opinion of the promoters, who have already taken steps in the matter.

ALBANY, N. Y.—Application has been made to the state railroad commissioners for permission to change the name of the Mineola, Roslyn & Port Washington Railroad to the New York & North Shore Traction Company. The company also wishes to increase its stock from $150,000 to $1,250,000. It plans to build a road from Oyster Bay to Flushing.

SCOTTDALE, PA.—The council of West Newton borough has granted a franchise to the Pittsburg, McKeesport & Westmoreland Street Railway Company to occupy certain streets in that town for street railway purposes. The company proposes to build a line from Herminie to West Newton by way of Blackburn and Gratztown, with a branch to Suterville. It is expected that work will begin in a short time.

FREDERICK, MD.—At a meeting in Frederick of the directors of the Washington, Frederick & Gettysburg Railway Company it was decided to arrange at once for the equipment of the road and to secure the necessary material and rolling stock for this end of the line. Funds are now being raised to continue the building of the road from Thurmont to the Pennsylvania state line. Gettysburg, Pa., is the destination of the road.

DENVER, COL.—Joseph A. Osner, a Denver railroad contractor, has received the contract for building the new electric line from Englewood to Roxborough Park by way of Littleton. Grading on the road has been commenced. The contract calls for the completion of the road by August 1, although the park will not be opened for tourists until next summer. Roxborough Park is twenty miles from Denver, near the mouth of Platte cañon.

TROY, N. Y.—Work has been commenced to enlarge the Glens Falls power plant of the Hudson Valley Railway. The improvements planned include a great increase in capacity. The station practically will be rebuilt to make it fireproof and new equipment will double the power output. Three 600-kilowatt converters will be installed. The Lake George power plant of the Hudson Valley will also be improved and enlarged by the addition of a 300-kilowatt converter.

NASHVILLE, TENN.—Work has been begun on the interurban electric railroad to be built from Nashville to Franklin, Columbia and Mt. Pleasant, Tennessee. Eastern capitalists propose to finance an electric road through Humboldt, Gadsden, Alamo, Johnson's Grove, Maury City, Crockett Mills, Eaton, Brazil and Gibson Wells, connecting with the Illinois Central at Dyersburg Falls or Newbern. Surveys are being made for the purpose of compiling statistics to submit to the capitalists.

DETROIT, MICH.—The Pontiac, Oxford & Northern will probably change hands and be transformed from a steam line extending 112 miles from Pontiac to Caseville and up into the Thumb, to an electrically operated interurban system. Robert Oakman and Detroit capitalists have secured an option on sixty per cent of the capital stock of $1,000,000, which option extends to September. Mr. Oakman states that if the deal is carried through the road will be electrified and put into first-class condition.

JACKSON, MICH.—President Henry R. Carse and Treasurer N. S. Potter, of the Jackson, Ann Arbor & Detroit Electric Railway Company, have entered into a contract with the Detroit United Railway Company, by the terms of which the latter agrees to purchase the former company's holdings. The deal covers the franchises, tracks, roadbed and everything connected with the company's work. The line is the old Boland route started several years ago between Plymouth and Northville, and from Grass Lake east

beyond Chelsea. Recently work was started in the vicinity of Dearborn and plans were pushed to connect Wyandotte and Dearborn with Detroit.

ITHACA, N. Y.—The firm of A. W. Flint & Company, promoter of electric railroads, has signed a contract to purchase the Ithaca Street Railway Company, which in the past has been controlled by Edward G. Wyckoff, of this city. The reported price that will be paid for the system is $200,000. It is understood that through this sale the Ithaca system will be consolidated with the New York, Auburn & Lansing Interurban Railroad, which is now being built from Auburn to Ithaca.

LOS ANGELES, CAL.—A new coast line railroad, extending from Los Angeles to Santa Barbara, to be electrically operated, is to be built. The line is a Harriman enterprise and will ultimately be extended to San Francisco. The Malibu and Hueneme Railroad, now being built from Santa Monica in a northerly direction and heretofore supposed to be a link of the Western Pacific, is to be the nucleus of the new line. It will be the first division of the Southern Pacific to be operated by electricity.

CHATTANOOGA, TENN.—It is reported that the Chattanooga Southern Railroad, which is owned by the Louisville & Nashville Railroad and which went into the hands of a receiver recently, will be turned into an interurban electric railway when the Hale's bar lock and dam power plant is finished. As proposed this plant will generate 50,000 horse-power. It is said that C. E. James, a local capitalist and a stockholder of the Chattanooga Southern, and others are to get control of the road and make an electric line of it.

OKLAHOMA CITY, OKLA.—G. N. Martin, representing the Chicago Company that has secured a charter under the name of the El Reno, Oklahoma City & Shawnee Electric Railway Company, has closed a contract by which his company has secured the privilege of entrance to and exit from this city over the lines of the Oklahoma City Railway Company and also the use of the latter company's terminal facilities. A stipulation in the contract provides that the interurban electric railway company must have constructed ten miles of its line before the contract becomes operative.

DANBURY, CT.—The construction of an electric railway line from Danbury to Bridgeport has been made possible by the action of the house of representatives at Hartford in passing the bill granting the company a charter for the road. The senate had passed the bill. The men whose names appear in connection with the enterprise are William H. Marigold, postmaster of Bridgeport, and Henry E. Reilly and John T. King, also of Bridgeport. The company is authorized to sell stock to an amount not exceeding $2,000,000 and it also has the right to sell electricity for lighting, power and heat in towns in which no company has a charter for that purpose.

TEMPLE, TEX.—An adjourned annual meeting of the stockholders of the Belton-Temple Traction Company was held recently, at which the following board of directors was elected for the ensuing year: Samuel Watts, Calvin Greene, A. C. Mays, H. E. Ahrens, G. K. Watson, J. A. McDonald, L. F. Treaster, W. H. Taylor, J. C. Houser, W. R. Barefoot and W. C. Davies, all of Pennsylvania; A. F. Bentley, of Temple, and George W. Tyler, of Belton. The annual election of officers was deferred for another meeting, which will be held by the directors at Lewistown, Pa. Heavy expenditures have been made during the year in betterments and permanent improvements.

HARRISBURG, PA.—With the issuance of a charter for the Philadelphia, Valley Forge & Suburban Railroad Company, the incorporation of the Valley Forge system of trolley lines is complete. The new road is authorized to build a line from the Sixty-ninth street station of the "L" to Valley Forge and Phoenixville. The project is being financed by L. Knowles Perot, of Bala, who appears in the incorporation papers as president of the company. The other incorporators are A. D. Whiting, David Rombold, Jr., and Edward W. Johnson, of Philadelphia; James A. Bunting, of Secane; Morris H. Wetherill, of Haverford, and Robert C. Selden, of Norristown. The company is capitalized at $600,000.

SPOKANE, WASH.—General Manager J. B. Ingersoll, of the Spokane & Inland, announces the inauguration of passenger service south from Oakesdale to Garfield and Palouse, a distance of nearly twenty-five miles. For the present it is probable that trains will reach Garfield by electric power, and then proceed to Palouse by steam, as the overhead construction is still incomplete between those towns. With the opening of train service to Palouse the Spokane & Inland operates eighty-one miles of road, seventy-six miles from Spokane to Palouse and five miles on the western division, Spring Valley to Rosalia. This, with the forty-four miles now in operation on the Coeur d'Alene division and the twenty-three miles operated by the Spokane Traction Company, makes an aggregate mileage of 150 for the Inland Empire System.

TELEPHONE AND TELEGRAPH.

NATALBANY, LA.—A telephone line has been completed over the New Orleans, Natalbany & Natchez Railroad, and is now in operation from Natalbany to Montpelier. Later it will be extended to Pine Grove.

WAYNESBURG, PA.—The Greene County Telephone Company has let a contract to the Dean Electric Company for a new switchboard at Waynesburg at a cost of $6,480. The board has a capacity of 2,400 telephones.

NEW YORK, N. Y.—The telephone line under construction between Emporia, Kan., and Pueblo, Col., will be completed within a few weeks, thus establishing direct telephone connection between Denver and New York.

ELY, NEV.—E. H. Harrison, manager of the Utah & Nevada Telephone Company, a branch of the Rocky Mountain Bell Telephone Company, states that his company will begin immediately the construction of its proposed telephone line from Salt Lake to Ely. The new system will parallel the Western Pacific road from Salt Lake to Ibapah, in the Deep creek country, and from there on the line will strike a direct course for Ely. The contracts have already been let for building the line in sections.

WATERTOWN, N. Y.—The Central New York Telephone and Telegraph Company has sub-licensed the Northwestern Telephone Company, of Carthage, and the toll lines of that company and those of the Central New York Telephone and Telegraph Company have been merged, thereby severing the connection of the Northwestern Telephone Company and the Citizens Telephone Company, of Watertown. This arrangement will allow the Northwestern Company to do the exclusive exchange business of Carthage and at points on the Carthage & Adirondack Railroad.

MONTPELIER, VT.—An important change affecting this vicinity will result from the action of the directors of the New England Telephone and Telegraph Company. The Vermont Telephone Company has taken over the holdings of the New England company in Montpelier, Barre, Waterbury, Randolph and vicinity. The latter company has had nominal control of this property but it now becomes an actual control. The capital stock was recently increased from $50,000 to $125,000. The directors are: Colonel A. C. Brown, Colonel J. G. Brown, and H. J. M. Jones, of Montpelier, and N. D. Phelps, of Barre.

ST. JOHN, NEW BRUNSWICK—The annual meeting of the St. Martins Telephone Company was held recently. The principal business done was the election of officers for the ensuing year. Those appointed were as follows: president, C. M. Bostwick; vice-president, W. E. Skillen; secretary and manager, A. D. McMackin; directors, W. M. Jarvis, R. O. Stockton and C. E. Trueman. The extension of the company's lines to Ten Mile Creek was decided upon. A proposition was also made to have the present telephones used by the company removed and replaced by those of a more modern type. The matter has not been definitely decided yet.

PLYMOUTH, N. H.—Telephone service in the territory north of Ashland and Plymouth and extending to Woodsville and Franconia, roughly speaking, is to be handled by the White Mountain Telephone Company, a corporation recently organized under the laws of the state of New Hampshire, with Allan Hollis, of Concord, as president. The White Mountain Telephone Company will work in conjunction with the New England Telephone and Telegraph Company, with whose toll lines connection will be made at Plymouth, Ashland, Bradford, Vt., and Woodsville. Walter I. Lee, of Plymouth, for many years president and general manager of the Plymouth & Campton Telephone Exchange Company, is the general manager of the White Mountain Telephone Company.

OBITUARY NOTE.

MR. FRANCIS L. CLARKE, sixty-three years old, chief engineer of the Westinghouse Air Brake Company, died on May 28, at Los Angeles, Cal., where he went several weeks ago for his health. Mr. Clarke was born on Long Island, N. Y., being a descendant of Governor Griswold, of Connecticut. When very young his parents removed to Cincinnati. At the outbreak of the Civil War he enlisted in a volunteer regiment at Ravenna, Ohio. Mr. Clarke was the designer of the Westinghouse air brake. He had been connected with the Westinghouse interests for the past forty years, having become associated with George Westinghouse immediately after he returned from the war. A widow and three children survive him.

PERSONAL MENTION.

MR. ROBERT E. NOYES, a graduate of the University of Nebraska, has been appointed assistant electrical instructor at the Case School of Applied Science, Cleveland, Ohio.

MR. PERCY E. COLLINS, who has been in charge of the motor department of the Leominster (Mass.) Electric Light and Power Company, has resigned to accept a similar position in Laramie, Wyo.

MR. FRANK ARNOLD has tendered his resignation as manager of the Oswego Traction Company, Oswego, N. Y., to become general manager of the Fort Dodge, Des Moines & Southern system, Des Moines, Iowa.

MR. LOUIS LEVINE, purchasing agent of the Woonsocket Electric Machine and Power Company, Woonsocket, R. I., for over twenty years, has resigned to accept a similar position with Belcher & Loomis, of Providence, R. I.

MR. L. K. BURGE, formerly train dispatcher for the Detroit, Monroe & Toledo Short Line, Monroe, Mich., has been appointed general superintendent of the lines of the Lake Shore Electric Railway Company, Cleveland, Ohio.

MR. A. W. ZAHM, for six years manager of the Brice Gas and Electric Company, Mason City, Iowa, has resigned to take the management of a Grand Rapids syndicate plant at Fort Dodge. Mr. Zahm is president of the Iowa State Electrical Association.

MR. GEORGE W. NEWMAN has resigned as superintendent of the North East (Pa.) Electric Light and Power Company, to take effect July 1. With others Mr. Newman has purchased the electric light plant at Edina, Mo., and will assume the duties of general manager of the Edina plant.

MR. GEORGE T. CAREY, for some time connected with the Charleston, S. C., office of the Southern Bell Telephone and Telegraph Company, has been promoted to the position of manager at Aiken, S. C. In addition to this office Mr. Carey will have charge of the tributary exchanges at Batesburg, Edgefield, Johnson and Leesville.

ELECTRICAL SECURITIES.

An otherwise dull and featureless market was considerably stirred last week by a decline in the price of active stocks, which reached a point almost as low as that touched during the middle of last March. Just what brought about this reaction is hard to understand, as every indication was encouraging and dividend disbursements have gone on as usual. With few exceptions the rate of dividends upon our leading railways and industrial shares appears to be in absolutely no danger of reduction. One of the notable characteristics of the business and financial situation is that, despite the trouble and depression in Wall street, the amount of general business contraction throughout the country is so trivial as to be hardly noticeable. The iron and steel trade, according to a trustworthy account, was never more flourishing than it is at the present moment. Cotton manufacture is undoubtedly prosperous, and the copper trade, which quite recently has come to occupy a most important and prominent place in the country's business life, is in an almost impregnable condition with regard to the upkeep of present rates. The crop reports show considerable improvement over former estimates, and there is every indication that unless professional manipulation will deter the market for some time, a genuine rise in values will soon come about.

ELECTRICAL SECURITIES FOR THE WEEK ENDING JUNE 8.

New York:	*Closing.*
Allis-Chalmers common	10⅞
Allis-Chalmers preferred	31
Brooklyn Rapid Transit	54¾
Consolidated Gas	119
General Electric	140
Interborough-Metropolitan common	17½
Interborough-Metropolitan preferred	49
Kings County Electric	118
Mackay Companies (Postal Telegraph and Cables) common	67
Mackay Companies (Postal Telegraph and Cables) preferred	66⅜
Manhattan Elevated	135
Metropolitan Street Railway	85
New York & New Jersey Telephone	112
Western Union	80
Westinghouse Manufacturing Company	142½

The guaranteed quarterly dividend of 1¾ per cent on the capital stock of the Manhattan Railway Company is payable July 1 to stock of record on June 14. Books closed June 14 and will reopen June 26.

Directors of the Interborough Rapid Transit Company have declared the regular quarterly dividend of 2¼ per cent, payable July 1 to holders of stock and voting trust certificates of record June 17. Books close June 17 and reopen July 1.

Directors of the Interborough-Metropolitan Company have declared the regular quarterly dividend of 1¼ per cent upon the preferred stock. The dividend is payable July 1 to stockholders of record June 10. Books closed June 10 and will reopen July 1.

According to a representative of the General Electric Company practically the entire issue of $13,000,000 5 per cent ten-year debenture bonds, equal to 20 per cent of the present holdings of stock, will be subscribed for by the shareholders. The first payment of 50 per cent falls due on July 20, 1907, and the second payment of 50 per cent on January 20, 1908, stockholders having the privilege of making the full payment on July 20.

Boston:	*Closing.*
American Telephone and Telegraph	108
Edison Electric Illuminating	205
Massachusetts Electric	57
New England Telephone	110½
Western Telephone and Telegraph preferred	69

The directors of the American Telephone and Telegraph Company, at a meeting held in Boston June 4, voted to issue $21,925,200 of new stock. Stockholders of record June 15 will be entitled to subscribe to the new shares at par to the extent of one new share for every six they hold. It is said that the proceeds will be used as part of the financing for the year 1908. All the needs for this year have been provided for by the recent issue of $100,000,000 of convertible bonds. The statement of the company for the six months ended May 31 shows a surplus after the payment of fixed charges and dividends of $1,800,000, which is more than enough to pay the regular 8 per cent dividend on the new issue, and is $300,000 more than the surplus shown last year at this time. The directors also declared at the meeting the regular quarterly dividend of 2 per cent, payable July 15 to stock of record June 15.

Philadelphia:	*Closing.*
Electric Company of America	9¾
Electric Storage Battery common	48
Electric Storage Battery preferred	48
Philadelphia Electric	8
Philadelphia Rapid Transit	23¼
United Gas Improvement	92¼

Directors of the Union Traction Company have declared a semi-annual dividend of 2½ per cent, payable July 1 as registered June 8. This dividend puts the stock on a 5 per cent basis, and will be the rate paid up to 1909, when it will go on a 6 per cent basis. The dividends are guaranteed by the Philadelphia Rapid Transit Company.

Chicago:	*Closing.*
Chicago Telephone	122
Chicago Edison Light	138
Metropolitan Elevated preferred	65
National Carbon common	71
National Carbon preferred	113
Union Traction common	—
Union Traction preferred	—

Directors of the Chicago Telephone Company have declared the regular quarterly dividend of 2½ per cent upon the capital stock, payable June 30. Books close June 26 and reopen July 1.

During May the average daily number of passengers carried on the Oak Park elevated, with transfers, was 48,683, an increase of 946.

NEW INCORPORATIONS.

NASHVILLE, TENN.—Jackson County Home Telegraph Company. $1,500. Incorporators: A. M. McCauley, J. S. Ray, J. M. Dean, L. I. Hix, J. L. McConners.

ALBANY, N. Y.—The Lockport Light, Heat and Power Company. $600,000. Directors: A. S. Cooke, M. T. Dodge, James Abbott and C. D. Beekman, New York city.

TAMAQUA, PA.—Commonwealth Light and Power Company. To furnish light and power to the residents of Cass township and the neighboring district. $5,000.

DOVER, DEL.—Oklahoma Fuel, Light and Power Company. To engage in the manufacture and distribution of electric current for light, heat and power. $500,000.

WASHINGTON, PA.—The Waynesburg & Monongahela Street Railway Company. To build a fourteen-mile trolley line between Waynesburg and Millsboro. $84,000.

SALT LAKE CITY, UTAH—The Manti Telephone Company, of Manti. $10,000. Directors: A. H. Christensen, A. O. Anderson, E. D. Sorenson, Stanley Crawford and Quince Crawford.

ALBANY, N. Y.—The Ithaca-Owego Traction Company. To build an electric road fifty miles long from Ithaca to Owego. $200,000. Directors: J. F. Delaney, C. W. Munson, of Chicago, and local capitalists.

DENVER, COL.—Plateau Valley Railway Company. $50,000. Incorporators: John D. Carlisle, Thomas H. Brown, Lemuel L. Stewart, H. T. Roeschlaub, Strand M. Logan, Lee L. Prewett, William M. Porter, Mesa.

MILWAUKEE, WIS.—Central Wisconsin Telephone Company, Black River Falls; an amendment increasing its capital from $50,000 to $100,000. Rush River & Eau Claire Telephone Company, Baldwin; an amendment increasing its capital from $3,520 to $12,000.

RALEIGH, N. C.—The Swannanoa Valley Railway Company, Black Mountain. To build, maintain, equip and operate a street or suburban railway from Asheville to Swannanoa Station, Black Mountain, Montreat and other places in the Swannanoa valley. $300,000, with $1,200 subscribed. Incorporators: F. T. Meriwether, Edward S. Caldwell, P. R. Moale, Hugh La Barbe, James M. Chiles and W. R. Whitson.

NEW MANUFACTURING COMPANIES.

MENOMINEE, MICH.—The Menominee Insulated Electric Wire Company has been organized with a capital of $100,000 and Henry Tideman as president. The new company is composed of local capitalists.

COLUMBUS, OHIO—The Johnson-Kennedy Electric Company, of Cincinnati, has been incorporated by John M. Kennedy, Jr.; Claude W. Johnson, Edward C. Drach, W. H. Burtner, Jr., and John H. Miller. They will make and deal in electric machinery and apparatus. The capital is $10,000.

CHARLOTTE, N. C.—C. E. Bradshaw, Oliver Holmes and F. H. Bradley are the incorporators of a new electrical concern that will operate in this city. A charter has been granted and the firm will do business under the name of the Bradshaw Electric Company. The authorized capital stock is $50,000.

SYRACUSE, N. Y.—The Overland Electric Company has been incorporated to manufacture electrical appliances. Directors: T. Arthur Whittaker, Albert H. Bremer, William F. Buck and George E. Meigs of this city; William J. Chattin and August H. Hoenisch, of Philadelphia, and Heber C. Elbridge, of Albany.

TRENTON, N. J.—Articles of incorporation of the Railway Safety Appliance Company, formed with a capital stock of $150,000 to manufacture a safety appliance to prevent the spreading of railroad rails have been filed. The incorporators are: J. F. Rogers and J. R. Streeter, of New York city; E. T. Thomas, of Brooklyn; Charles H. Haight, of Jersey City, and C. H. Bowne, of Brooklyn.

EDUCATIONAL NOTE.

WORCESTER POLYTECHNIC INSTITUTE—Commencement week at Worcester Polytechnic Institute, Worcester, Mass., began Sunday, June 9, with the delivery of the baccalaureate sermon by the Rev. Edward Payson Drew. On Tuesday, June 11, the new electrical engineering building was open for inspection, and in the evening the annual commencement lecture was delivered in that building by A. H. Richey, of the institute, on "The Electric Railway." Wednesday was field day for the athletic sports, and in the afternoon the hydraulic laboratory was opened and the new equipment exhibited. Thursday the graduating exercises were held in the new electrical engineering laboratory. The commencement address was delivered by Charles F. Scott, consulting engineer, Westinghouse Electric and Manufacturing Society, and was entitled, "Some Aspects of Electrical Development."

INDUSTRIAL ITEMS.

THE TRIUMPH ELECTRIC COMPANY, Cincinnati, Ohio, has published in bulletin No. 311 a description in Spanish of its motors and generators.

THE BROWN & SHARPE MANUFACTURING COMPANY, Providence, R. I., has published a new catalogue describing and illustrating machinists' tools.

THE MANHATTAN ELECTRIC RANGE COMPANY, 150 Nassau street, New York city, has some attractive literature illustrating and describing its commercial electric ranges.

THE THOMAS & BETTS COMPANY, 299 Broadway, New York city, has some interesting literature ready for distribution concerning the "T. & B." insulating stud for electrical installation.

THE DE LA VERGNE MACHINE COMPANY, foot East 138th street, New York city, has ready for distribution some interesting literature describing and illustrating the Koerting four-cycle gas engine.

THE WARNER ARC LAMP COMPANY, Muncie, Ind., has published a leaflet describing the Warner arc lamps for multiple direct-current circuits, multiple alternating-current circuits, and series direct-current circuits.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, Pittsburg, Pa., has published a handsome catalogue describing and illustrating the electrical equipment at the Hornell (N. Y.) shops of the Erie Railroad.

W. E. G. MITCHELL, 88 Maiden Lane, New York city, successor to A. T. Howard & Company, has ready for distribution a price list and some descriptive matter concerning "B-S." electrical insulating compounds and insulating varnishes.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., in bulletin 1060, describes and illustrates belted alternators, type "AB." These alternators have been designed especially for lighting and power plants in small towns, factories, public and private institutions, office buildings, etc.

THE DEAN ELECTRIC COMPANY, Elyria, Ohio, has published a handsome catalogue describing its magneto switchboards. In addition to the half-tone illustrations showing the details of assembly, there are numerous diagrams indicating the various connections and dimensions of the apparatus.

THE REVOLUTE MACHINE COMPANY, 523 West Forty-fifth street, New York city, is calling attention to the Everett-McAdam continuous electric blue-printing machine. This machine was described in a recent issue of the ELECTRICAL REVIEW. It will make a single print of any length, of uniform tint from one end to the other.

THE JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J., announces that at a special meeting of the company, held May 31, to take action on the death of Vice-President and Treasurer John A. Walker, George T. Smith was elected vice-president; George E. Long, treasurer, and Harry Dailey, director and secretary.

THE SEMI-DRY BATTERY COMPANY, Newark, N. J., announces the Dunn semi-dry cell for automobiles, motor-cycles, launches, auto-boats, gasolene engines, telephones, annunciators, house bells, railway signals and all open-circuit work. This dry cell is made upon radically different principles from the ordinary

dry cell. Tests have shown some remarkable characteristics, full information concerning which will be furnished upon application to the company.

THE COOPER HEWITT ELECTRIC COMPANY, 220 West Twenty-ninth street, New York city, announces that it has recently opened a district sales office at 66 State street, Albany, N. Y., in charge of H. S. Knapp, manager. This office will handle the selling of Cooper Hewitt mercury-vapor lamps in the northern and eastern part of New York state.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, N. Y., has published two pamphlets describing, respectively, series and bridging dry battery wall telephones, and central energy portable desk telephones. The company distributed at the recent Independent telephone convention at Chicago a series of colored postal cards.

THE STANDARD ELECTRIC LAMP COMPANY, INCORPORATED, 127-129 Van Buren street, Newark, N. J., which was established in 1895, announces a change of ownership in April, 1907. The officers are: C. C. Curry, president; William Ropes, secretary and treasurer; Maurice Welch, superintendent. Mr. Welch is a well-known lamp expert. The company is engaged in the manufacture of high-grade refilled lamps. It is the intention of the present management to put out lamps of the best grade in material and workmanship, and guaranteed to equal in life and efficiency any lamp on the market.

H. M. BYLLESBY & COMPANY, INCORPORATED, American Trust Building, Chicago, Ill., has been retained as consulting engineer for the Sioux Falls Light and Power Company, Sioux Falls, S. D. A water power with a head of about eighty feet is to be developed on the Big Sioux river at this point. The company has also been retained as consulting and operating engineer for the Flathead Valley Water Power Company, of Kalispell, Mont. This water power is situated at Big Fork, on the Big Fork river, with a head of about 105 feet. The development is to be added to, and the capacity of the plant greatly increased.

THE ELECTRICAL ACCESSORIES COMPANY, 1135 Broadway, New York city, announces the introduction to the American public of the "Just" tungsten lamp. These lamps, which have been in commercial use in Europe for the past year, are made under the patents of Doctors Just and Hanaman, and, in appearance, closely resemble the carbon filament lamp. The filaments are of pure tungsten, and are three in number. While these lamps are manufactured for different candle-power, the company is importing for the present only the standard forty-candle-power hefner for 100 to 120 volts, Edison base. These lamps consume one watt per hefner.

DATES AHEAD.

Jamestown Tercentennial Exposition. Norfolk, Va., April 26 to November 30.

Pacific Coast Electric Transmission Association. Los Angeles, Cal., June 18-20.

Association of Railway Telegraph Superintendents. Annual meeting, Norfolk, Va., June 19.

American Society for Testing Materials. Annual meeting, Atlantic City, N. J., June 20-22.

American Institute of Electrical Engineers. Annual meeting, Niagara Falls, N. Y., June 25-28.

New York State Street Railway Association. Annual meeting, Pine Bluff Point, N. Y., June 26-27.

Society for the Promotion of Engineering Education. Case School of Applied Science, Cleveland, Ohio, July 1-3.

National Electrical Contractors' Association. Annual meeting, New York city, July 17-19.

International Association of Municipal Electricians. Norfolk, Va., August 20-22.

Ohio Electric Light Association. Annual meeting, Toledo, Ohio, August 20-22.

Canadian Electrical Association. Annual convention, Montreal, Quebec, September 11-13.

Record of Electrical Patents.

Week of June 4.

855,440. ELECTRICAL SAFETY DEVICE. Richard Apt, Berlin, Germany, assignor to General Electric Company. Radioactive material is placed in proximity to the spark-gap.

855,441. COOLING JACKET FOR ELECTRIC-FURNACE ELECTRODES. Frederick M. Becket, Niagara Falls, N. Y. Adjustable cooling jackets are placed around the electrodes.

855,449. PROCESS OF AMELIORATING WINES AND SPIRITS AND OF STERILIZING LIQUIDS. Victor Dorn, Wilmersdorf, near Berlin, Germany. Electrical discharges are passed through the liquid after it is saturated with oxygen.

855,450. POTENTIAL REGULATOR. James H. Duncan, St. Louis, Mo., assignor of one-half to James W. Kaye, St. Louis, Mo. A secondary source of supply may be introduced into the armature circuit.

855,470. MOTOR-CONTROLLING DEVICE. Carl Mittelstrass, Hermsdorf, and Albrecht Frank, Berlin, Germany, assignors to General Electric Company. A controller operated by an auxiliary motor.

855,447. PROCESS OF PRODUCING CALCIUM CARBID. Edgar F. Price, Niagara Falls, N. Y., assignor to Union Carbide Company, Niagara Falls, N. Y. An arc furnace with receptacles for the molten material which are removable.

855,478. PROCESS OF SMELTING REFRACTORY ORES AND PRODUCING FERRO-ALLOYS. Edgar F. Price, Niagara Falls, N. Y. The material is fused by a resistance conductor in a furnace with movable receptacles.

855,479. PROCESS OF SMELTING REFRACTORY ORES AND PRODUCING FERRO-ALLOYS. Edgar F. Price, Niagara Falls, N. Y. The material is fused in an arc furnace with movable receptacles.

855,480. ELECTRIC-RESISTANCE FURNACE. Edgar F. Price, Niagara Falls, N. Y. A furnace adapted to receive in succession a number of receptacles for the molten material.

855,484. CONSTANT-CURRENT GENERATOR. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. A generator with brushes placed less than forty-five degrees from the line of magnetization.

855,485. CONSTANT-CURRENT GENERATOR. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. An open coil generator with a plurality of series transformers, one connected in each armature circuit.

855,492. CONDUIT FOR ELECTRIC RAILWAYS. John S. Alexander, New York, N. Y. A two-part conduit.

855,513. RECIPROCATING ELECTRIC MOTOR. Ronald P. Irving, Quincy, Mass. A coil and plunger magnet.

855,536. ELECTRIC COOKING-STOVE. David C. Smith, Kalgoorlie, Western Australia, Australia. An electrically heated oven.

855,545. TELEPHONE-EXCHANGE SYSTEM. Harry G. Webster, Chicago, Ill., assignor to Milo G. Kellogg, Chicago, Ill. A manual exchange.

855,588. METHOD AND APPARATUS FOR PROTECTING MARINE WOODEN STRUCTURES. Thomas N. Prudden, San Francisco, Cal. Electric current is passed through the water-soaked wood.

855,601. ELECTRIC RAILWAY SWITCH. Edward F. Winfield, Los Angeles, Cal., assignor to Jacob Baum, Los Angeles, Cal. A switch operated by electromagnetic means controlled from the car.

855,623. MOTOR CONTROL. Henry B. Emerson, Schenectady, N. Y., assignor to General Electric Company. A differential gear attached to the variable-speed motors.

855,713. SELF-EXCITING ALTERNATOR. Leon J. Le Pontois, New Rochelle, N. Y., assignor to Poly-Phase Ignition System Company. A magneto with auxiliary field coil.

855,723. ELECTRIC REGULATING DEVICE. James F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Company, Albany, N. Y. A motor-operated regulator.

855,727. ELECTRIC SIGNALING SYSTEM. Edward L. Orcutt and Richard Sheldon, New York, N. Y., assignors to Railway Electric Signal Company. A block-signal system.

855,729. ELECTRIC BELL. Marcus Plato, London, England, assignor of one-half to Arthur William Macleod, London, England, A bell with counter-balanced hammer.

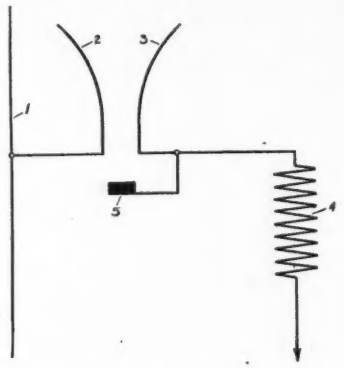
855,801. GAS VALVE. Daniel M. Moore, Newark, N. J., assignor to Moore Electrical Co., New York, N. Y. An automatic gas valve for vacuum tubes.

855,805. GOVERNOR FOR ELECTRIC MOTORS. Alphonse F. Pieper, Rochester, N. Y. A governor on the motor controls the voltage of the supply.

855,877. COMMUTATOR GRINDER. Ellsworth S. Bryant and Henry J. Bery, Detroit, Mich. An adjustable commutator grinder.

855,880. BATTERY. Bertram B. Downs, St. Paul, Minn. A battery of dry cells.

855,892. MEANS FOR OPERATING THE VALVES OF MOTIVE-POWER ENGINES. Ramsey Kendal, Darlington, England, assignor of one-half to J. Stone & Company, Limited, Deptford, England. The valves are operated by electromagnets.



855,440.—ELECTRICAL SAFETY DEVICE.

855,897. CONTROLLER FOR ELECTRIC MOTORS AND SIMILAR DEVICES. Harry W. Leonard, Bronxville, N. Y. A starting rheostat.

855,911. TELEPHONE RECEIVER. Kelley M. Turner, New York, N. Y., assignor to General Acoustic Company. A receiver with two sub-divided bobbins.

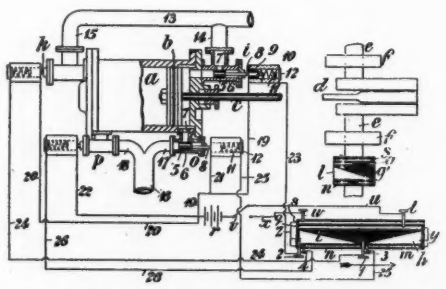
855,966. ELECTRIC SIGNALING DEVICE. Edward L. Orcutt, New York, N. Y., assignor to Railway Safety Signal Company. An alternating-current block system.

855,967. ELECTRIC SIGNALING DEVICE. Edward L. Orcutt, New York, N. Y., assignor to Railway Safety Signal Company. A block signaling system operated by a generator on the train.

855,968. ELECTRIC SIGNALING DEVICE. Edward L. Orcutt, New York, N. Y., assignor to Railway Safety Signal Company. A block system utilizing both rails.

855,971. RAILWAY SIGNAL. Charles C. Phillips, Owensboro, Ky. A signal system with normally open circuits.

855,972. CONTROLLER FOR ELECTRIC MOTORS. William D. Pomeroy, Norwood, Ohio, assignor, by mesne assignments, to the Bullock Electric Company. A controller for a multiple-voltage system.



855,892.—MEANS FOR OPERATING THE VALVES OF MOTIVE-POWER ENGINES.

855,991. PROCESS OF MAKING STORAGE-BATTERY PLATES. William L. Silvey, Dayton, Ohio. The active material is enclosed within a perforated envelope.

856,007. JEWELED BEARING FOR ELECTRICAL AND OTHER INSTRUMENTS. John Wennstrom, Suffern, N. Y. A jeweled bearing with removable stub.

856,010. ELECTROPNEUMATIC BRAKING DEVICE FOR RAILWAY CARS. Ragner Wikander, Westeras, Sweden. An electrically controlled air-brake apparatus.

856,012. MEANS OF TESTING INSULATED WIRES. Newton A. Wolcott, Warren, Ohio, assignor to the Packard Electric Company, Warren, Ohio. The wire is passed through two dielectric sleeves maintained at a high difference of potential.

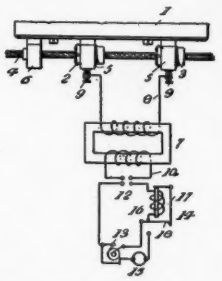
856,054. ELECTRICALLY HEATED STOVE. Fritz Gutjahr, Berlin, Germany. A hollow stove enclosing an electric heater.

856,061. ELECTRIC FURNACE. Aldus C. Higgins, Worcester, Mass. A furnace containing a plurality of electrodes.

856,071. ELECTRIC SIGNAL. George Langlumé, New Orleans, La., assignor of one-half to Hyman Hirsch, New Orleans. A signal for pipe systems.

856,085. ELECTRIC CUTOUT. Philip T. McNally, Mandan, N. D. An electro-mechanical device for turning a switch.

856,094. ELECTRICAL SIGNALING DEVICE FOR RAILROADS. Edward L. Orcutt, New York, N. Y., assignor to Railway Safety Signal Company. Both track and train signals are provided.



856,012.—MEANS OF TESTING INSULATED WIRES.

856,095. ELECTRIC SEMAPHORE. Edward L. Orcutt, New York, N. Y., assignor to Railway Safety Signal Company. A semaphore with fixed arms on which are mounted incandescent lamps.

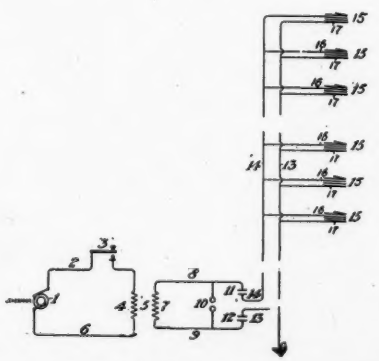
856,127. RAIL BOND. James J. Brennan, Fort Wayne, Ind. A stranded rail bond.

856,129. MACHINE FOR BASING INCANDESCENT LAMPS. William R. Burrows, Newark, N. J., assignor to General Electric Company. A machine for attaching lamp bases.

856,132. ELECTRIC BURGLAR ALARM. Bert J. Cizkovsky, Chicago, Ill. An alarm operated by a rocking movement of the support.

856,146. LOCKOUT DEVICE FOR TELEPHONES. Ruben C. M. Hastings and Thurston Matheny, Athens, Ohio. A lockout for party-line systems.

856,149. AERIAL RADIATING CIRCUIT. Peter C. Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Company, New York, N. Y. A radiator for electromagnetic waves, consisting of a step-up auto-converter.



856,150.—METHOD OF RADIATING ELECTROMAGNETIC WAVES.

856,150. METHOD OF RADIATING ELECTROMAGNETIC WAVES. Peter C. Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Company, New York, N. Y. Electromagnetic waves are set up by generating in separate circuits a series of magnetic fluxes in the same direction.

856,163. ELECTRIC RELAY. Isidor Kitsee, Philadelphia, Pa. The circuit is closed by a liquid electrolyte.

856,165. FLOOR-BOX FOR ELECTRIC WIRING. Hubert Krantz, New York, N. Y. A conduit outlet.

856,179. ELECTRIC SIGNAL. Robert Pfeil, Grunewald, Berlin, Germany, assignor to Siemens & Halske Aktiengesellschaft, Berlin, Germany. A motor-operated railway signal.